MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for November, 1901, is based on reports from about 3,100 stations furnished by employees and voluntary observers, classified as follows: regular stations of the Weather Bureau, 159; West Indian service stations, 13; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,562; Army post hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Railway Company, 96; Hawaiian Government Survey, 200; Canadian Meteorological Service, 32; Jamaica Weather Office, 160; Mexican Telegraph Service, 20; Mexican voluntary stations, 7; Mexican Telegraph Company, 3; Costa Rican Service, 7. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut.-Commander W. H. H. Southerland, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San Jose, Costa Rica; Capt. François S. Chaves, Director of the Meteorological Observatory, Ponta Delgada, St. Michaels, Azores, and W. M. Shaw, Esq., Secretary, Meteorological Office, London; Rev. Josef Algué, S. J., Director, Philippine Weather Service.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or 10^h 30^m west of Greenwich. The Costa Rican standard of time is that of San Jose, 0^h 36^m 13^s slower than seventy-fifth meridian time, corresponding to 5^h 36^m west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now always reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

During the temporary absence of Professor Abbe, Mr. H. H. Kimball has been designated Acting Editor of the REVIEW.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

The month opened with a storm of tropical origin central north of Porto Rico. At 11:10 a. m. of the 1st the following message was telegraphed the Weather Bureau offices at Hamilton, Bermuda; New York, N. Y.; Philadelphia, Pa., and Boston, Mass.:

Severe disturbance moving northward east of Turks Island will probably pass near Bermuda Saturday.

The following article from The Bermuda Colonist, of November 6, 1901, verifies the accuracy of the advices furnished:

THE LATE STORM.

The hurricane that was predicted by the Washington Weather Bureau for Saturday, arrived on time and raged around the islands for twenty-four hours. All the incoming steamers were delayed, in consequence, and those that were southward bound, the New York mail steamer especially, experienced exceedingly heavy weather.

The growing crops throughout the colony have suffered somewhat and the storm damage to property has been considerable. The principal damage reported has been occasioned to government property about the islands in the Great Sound, where the prisoners of war are interned, and it is said that the preliminary estimate of the damage reaches the sum of £2,000.

Reports from the westward state that the contractors for the dockyard extension works have also sustained some loss; a large boat used for conveying laborers to and fro between the old Terror and the shore foundered and a large quantity of baulk timber got adrift.

Atlantic coast shipping interests were notified on the 2d that a severe tropical storm was moving northeast near Bermuda, and similar advices were cabled to London, England.

From the 2d to the 5th the storm center moved northeastward over mid ocean attended by gales of great violence. There is no evidence that this storm reached the European coast. It appeared rather to gradually lose intensity over mid ocean from the 6th until the 8th, when depressions appeared, respectively, over the North Sea and near the Azores. In the meantime a disturbance of moderate strength had moved eastward over the Canadian Maritime Provinces, and during the 9th, passed to the southeast of Newfoundland. It is possible that this depression is identical with the severe storm that moved eastward over the British Isles during the 12th and 13th, and passed thence over the continent.

North Atlantic shipping interests were kept fully advised regarding storms which visited the western part of the ocean, and forecasts of the wind and the weather for the first three days out of steamers sailing east from American ports were issued daily.

The following letter, dated November 15, 1901, addressed by the secretary of Lloyd's, London, to the Chief of the United States Weather Bureau at Washington, indicates the degree of interest that is being taken in the Weather Bureau warnings by representatives of the commercial and shipping interests of the North Atlantic.

I am instructed to express to you the best thanks of the Committee of Lloyd's for the forecasts of bad weather in the Atlantic with which you have been so good as to allow them to be favored, and I am desired to convey to you the congratulations of my Committee on the infallibility of the predictions that have been supplied by these forecasts.

The most important storm of the month along the Atlantic seaboard of the United States began the night of the 23d and continued during the 24th.

The following special bulletin, issued from Washington on the 25th, indicates the general character of this storm, and of the action taken to issue warnings in connection therewith:

The severe storm that visited the Middle Atlantic and New England coasts Saturday night and Sunday, and which continued on the New England coast Monday, was most severely felt from New York to Boston, where maximum wind velocities ranging from 60 to 66 miles an hour from the northeast were reported Sunday.

Timely warning was given by the Weather Bureau of the approach of this storm, and before 1 p. m. Saturday, coast and shipping interests from Maine to Florida had been informed regarding its position, character, and course, and storm warnings had been ordered from Hatteras to Eastport. Monday morning Lloyd's, London, were cabled from Washington that a severe storm would pass over Newfoundland Monday night, moving northeast.

Commenting upon the storm, an article in the Boston Journal, of November 25, 1901, reads as follows:

AMPLE WARNING WAS GIVEN.

The Weather Bureau, whose timely warning has saved uncounted ships and their crews from the storm, predicts that the disturbance will pass away to-day, and that Tuesday morning the weather will be fair.

There had been plenty of warning of this storm. Early Saturday the storm signals had been hoisted on the Federal Building, and they were kept flying, and every good sailor saw that it was wise to have everything snug and safe aloft and alow, so the storm found nothing in the harbor to meddle with. As the wind kept coming fresher out of the north, some of the big vessels in the stream put down two hooks into the mud, and when the wind was blowing its strongest, 60 miles an hour, in the afternoon of yesterday, all the vessels were riding as prettily as if it were nothing but the ebbing tide which had slewed them round so that their bowsprits were writing words on the sky toward East Boston.

It was a coincidence of comment that this storm had come in the same way and at the same time as that terrible storm of 1898, when the steamer *Portland* was lost. This time, however, the lesson did not require a second teaching.

Several storms of seasonal intensity crossed the Great Lakes. Ample warnings were issued in advance of these storms and shipmasters generally profited by them.

A number of severe storms were reported on the British Columbia and Alaska coasts, and on the 28th a severe storm, for which warnings were displayed on the 27th, visited the middle California coast.

The first important cold wave of the month appeared over the British Northwest Territory on the morning of the 2d, extended over districts lying between the Mississippi River and the Rocky Mountains during the 3d, and caused heavy frosts in the Ohio Valley and the interior of the Southern States during the night of the 4th. The second cold wave of the month appeared in the extreme Northwest on the 6th, and extended southeast and east with rapidly diminishing intensity during the 7th and 8th.

Frost was reported in the Southern States on several dates, and in each instance its occurrence was anticipated in the forecasts or by special frost warnings.

The snowfalls of the month were unusually heavy for the season in the mountain districts of the Middle and North Atlantic States. The first heavy snowstorm occurred on the 13th and 14th, and extended from northern New England and the interior of New York to western Virginia. On the 19th, snow was reported in northern Georgia, and on the 24th heavy snow fell in the middle Allegheny Mountain districts.

Heavy rains from the 23d to 26th caused a marked rise in the head waters of the Ohio River. The value of the River and Flood Service of the Weather Bureau in forecasting marked changes in river stages is indicated by the following extract from the Pittsburg Despatch of November 27, 1901:

VALUABLE TO COAL COMPANIES.

That the value and importance of the local weather office service to the river interests can not be fully calculated was demonstrated on this rise.

Mr. Ridgeway had the information in advance of anyone else that a coal-boat stage of water would reach the upper Ohio River by Monday afternoon. At least thirty hours in advance of the crest of the rise he had officially notified the different coal interests here of the coming water. He predicted that there would be 12 feet of water, and his prediction has been verified within a few inches.

This valuable information from the Weather Bureau enabled the coal companies to get their fleets in readiness, and by the time shipping water came the steamers all had steam up and only awaited the signal to cut loose. As a result of the notice, many millions of bushels of coal have gone down the Ohio, and more will go to-day. A delay of twenty-four hours, and the indefinite information which would have been received through the regular channels of the coal companies would have broken the back of this great shipment. The great importance of the Weather Bureau to Pittsburg and its varied interests can not be calculated in dollars and cents, but an idea can be gained of its value through the fact that the notice, by being sent out so far in advance of the rise, gave employment to over five hundred men.

BOSTON FORECAST DISTRICT.

The chief meteorological feature of the month was a severe storm on the 24–25th. This storm was of southern origin, and it attained great force along the New England coast. At Block Island the wind reached a maximum velocity of 80 miles an hour. The highest velocity at Boston was 60 miles an hour, and a mean velocity of 44 miles an hour was maintained for a period of six hours. It is estimated that the storm was the most severe since the hurricane of November, 1898. Ample warning was given of the approach of the disturbance, and it is known that much benefit resulted to shipping and other interests. The press of the city commended the Bureau for the excellence of the service rendered. The Boston Evening Transcript of November 25 stated editorially as follows:

Whatever may be the record of the Weather Bureau with respect to the more vaguely defined forecasts, it has rarely made mistakes regarding big events. It sent out warnings previous to all our recent great storms, and had the people of Galveston acted promptly on its suggestions the disaster would have been mitigated somewhat. The warning sent out Saturday and the manner of its reception shows that we have come to entertain a wise respect for scientific forecasting.

The daily forecasts of the month were generally correct and often brought forth favorable comment from interested persons.—*J. W. Smith, Forecast Official.*

CHICAGO FORECAST DISTRICT.

A cold wave developed in the extreme Northwest on the 2d and gradually overspread the entire district. A second cold wave appeared in the Northwest on the 6th and moved eastward over the district, with a considerable fall in temperature. Cold-wave warnings were ordered in advance at all stations where marked temperature falls occurred.

A storm of considerable intensity reached the lakes on the 3d, and a second, with increased intensity, on the 6th and 7th. Storm warnings were ordered at all ports in advance of these storms. Warnings were ordered on the 11th for a storm of considerable force, which moved eastward across the lakes.

Storm, northeast warnings, were ordered for the northern Lake region on the evening of the 21st, and were extended to the balance of the upper lakes on the morning of the 22d. While some wrecks occurred during the month, and a few lives were lost, the warnings were generally heeded by vessel men, and sheltered harbors were sought.—*H. J. Cox, Professor.*

NEW ORLEANS FORECAST DISTRICT.

Frost, or special temperature warnings, were issued for some portion of this district on the 3d, 4th, 7th, 12th, 15th, 16th, 19th, 26th, and 28th. Frost occurred in each instance, and all frosts and freezes that occurred were forecast. The temperature warnings issued for the sugar interests on the 15th and 16th were fully verified. These warnings enabled all those who had not saved their seed cane to complete that work.

There were no well-marked storms during the month.—*I. M. Cline, Forecast Official.*

DENVER FORECAST DISTRICT.

The month was unusually fine, even in the mountain districts, where local storms so frequently occur at this season. Cold-wave warnings were issued on the morning of the 2d for Wyoming and northeastern Colorado, and these were verified except in the immediate vicinity of Denver.—*F. H. Brandenburg, Forecast Official.*

SAN FRANCISCO FORECAST DISTRICT.

The present month may be considered a wet November, the rainfall amounting to 3.48 inches, with ten rainy days and three days on which a trace of rain fell. The first week was marked by a pressure distribution approaching that of a typical dry month. This period marked the close of the raisin drying season. During this period no showers were forecast which did not occur, and no unnecessary warnings were issued.

On the morning of the 9th rain was forecast for southern California, and the forecast was verified. The disturbed condition on the California coast, which began on the 19th was anticipated. The p. m. map of the 18th showed the lowest pressure to be on the coast of northern California; the pressure and temperature change maps indicated on the morning of the 19th that the disturbance had moved northward, and on the 20th that it was in British Columbia and Alberta. Heavy rain which occurred in the vicinity of San Francisco on the night of the 20th was accurately forecast. The end of the month was marked by rainy weather, with conditions favorable for tule fog in the valleys and along the coasts.—*Alexander G. McAdie, Professor.*

PORTLAND, OREG., FORECAST DISTRICT.

The centers of storms, which controlled the weather in this district, passed farther north than usual; consequently the month was mild, and in most sections there was a deficiency of precipitation.

Many severe storms occurred on the Alaska and British Columbia coasts, and some of these storms passed far enough south to cause southerly gales along the Oregon and Washington coasts. Timely warnings were issued for all storms which visited the north Pacific coast, and shipping interests were well advised of their character and progress.—*E. A. Beals, Section Director.*

HAVANA, CUBA, FORECAST DISTRICT.

No important disturbance appeared in the West Indies during the month.—*Montrose W. Hayes, Section Director.*

AREAS OF HIGH AND LOW PRESSURE.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	2, p. m.	54	114	5, a. m.	48	85	1,325	2.5	530	22.1
II	4, a. m.	42	93	7, a. m.	42	76	1,050	3.0	350	14.6
III	5, p. m.	45	123	8, p. m.	38	80	2,350	3.0	783	32.6
IV	8, a. m.	54	114	§11, a. m.	43	74	2,550	3.0	850	35.4
				§11, a. m.	35	75	2,450	3.0	817	34.0
V	10, p. m.	45	123	13, a. m.	33	94	1,800	2.5	720	30.0
VI	13, a. m.	53	108	18, a. m.	48	85	1,300	†3.0	433	18.0
VII	17, p. m.	47	123§	22, a. m.	36	75	‖ 3,250	4.5	722	30.1
	18, p. m.	50	108§				‖ 2,125	3.5	607	25.3
VIII	20, p. m.	53	105	24, p. m.	46	60	2,220	4.0	555	23.1
IX	23, a. m.	30	99	25, p. m.	25	82	1,400	2.5	560	23.3
X	23, p. m.	53	108	27, p. m.	48	85	1,125	†2.0	562	23.4
XI	24, p. m.	43	109	27, a. m.	35	85	1,425	2.5	570	23.8
XII	26, a. m.	50	100	29, a. m.	34	78	1,750	3.0	583	24.3
Sums							26,120	42.0	8,642	360.0
Mean of 14 paths							1,866		617	25.7
Mean of 42.0 days									620	25.8
Low areas.										
I	1, a. m.	51	114	3, p. m.	47	85	1,525	2.5	610	25.4
II	2, a. m.	38	103	§3, p. m.	36	85	1,075	1.5	717	29.9
				§4, a. m.	28	82	1,425	2.0	712	29.7
III	5, a. m.	50	120	9, a. m.	48	54	3,425	4.0	856	35.7
IV	7, a. m.	53	117	11, a. m.	48	54	2,975	4.0	744	31.0
V	8, a. m.	33	105	9, a. m.	26	97	950	1.0	950	39.6
VI	9, a. m.	50	120	18, a. m.	48	54	4,450	9.0	494	20.6
VII	14, p. m.	41	126	17, p. m.	53	105	1,500	3.0	500	20.8
VIII	16, a. m.	43	105	19, p. m.	28	82	2,050	3.5	586	24.4
IX	18, p. m.	41	126	20, a. m.	48	125	600	1.5	400	16.7
X	20, p. m.	48	110	26, p. m.	46	60	‖ 3,525	6.0	588	24.5
							‖ 3,950	6.0	658	27.4
XI	22, a. m.	50	120	24, a. m.	49	90	1,400	2.0	700	29.2
XII	26, a. m.	53	121	29, p. m.	42	74	2,600	3.0	867	36.1
XIII	29, a. m.	53	121	*3, a. m.	48	54	3,200	4.0	800	33.3
				*5, a. m.	48	54	4,725	6.0	788	32.8
Sums							39,375	59.0	10,970	457.1
Mean of 16 paths							2,461		686	28.6
Mean of 59.0 days									667	27.8

*December. †Stationary for 2 days.

For graphic presentation of the movements of these highs and lows see Charts I and II.—*H. C. Frankenfield, Forecast Official.*

RIVERS AND FLOODS.

Low water stages continued during the month in the Mississippi and Missouri rivers. In the Ohio low stages continued until the last week of the month, when a steady, though not heavy, three days rainfall caused a moderate rise in the upper river and tributaries, the crest passing Portsmouth, Ohio, on the 30th. This rise was of the greatest value to all river interests. Thirty hours advance notice of the coming tide was given by the Weather Bureau Official at Pittsburg, and every effort was made by those affected to take immediate advantage of the situation. The coal industry was the one most benefited, since about five million bushels of coal were started on their journey to the mouth of the Mississippi River.

The rivers of the remaining districts of the country pre-

sented nothing of special interest. Lower stages were the rule, except in the Willamette and the Sacramento rivers on the Pacific coast, where the rains of the last week of the month caused a moderate rise.

Running ice was reported in the Mississippi River as follows: St. Paul, Minn., on the 18th and 19th, and from the 24th to the 28th, inclusive; La Crosse, Wis., from the 17th to the 19th, inclusive; and Dubuque, Iowa, on the 16th. On this date the ice harbor at Dubuque was also frozen over.

The Missouri River at Bismarck, N. Dak., froze over on the 7th, closing navigation for a time. There was no ice at the end of the month, although the river was frozen both above and below the city. At Pierre, S. Dak., there was running ice from the 15th to the 25th, inclusive, but not in sufficient quantities to necessitate the closing of navigation. The Red River of the North froze over at Moorhead, Minn., except at the bridges. In the Susquehanna River, at Wilkesbarre, Pa., the first ice was seen on the 28th; while in the Hudson, it appeared in such quantities as to compel the closing of navigation on the 30th.

The highest and lowest water, mean stage, and monthly range at 135 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport on the Red.—*H. C. Frankenfield, Forecast Official.*

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following summaries relating to the general weather and crop conditions are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau.

[Temperature is expressed in degrees Fahrenheit and precipitation in inches and hundredths.]

Alabama.—The mean temperature was 48.8°, or 4.6° below normal; the highest was 84°, at Bermuda, Eutaw, and Tuskegee on the 2d, and the lowest, 16°, at Scottsboro on the 16th and at Ashville on the 17th. The average precipitation was 1.85, or 1.38 below normal; the greatest monthly amount, 5.14, occurred at Uniontown, and the least, 0.17, at Cordova.

Conditions favorable for gathering late crops, but only moderately favorable for sowing and germination of fall grains; first killing frost of the season occurred very generally in north-central and northern counties on 5th or 6th, and throughout the rest of the State on the 16th or 17th.—*F. P. Chaffee.*

Arizona.—The mean temperature was 57.1°, or 5.0° above normal; the highest was 94°, at Sentinel and at Signal on the 1st and other dates, and the lowest, 14°, at Flagstaff on 18th and at Fort Defiance on 14th and 27th. The average precipitation was 0.32, or 0.34 below normal; the greatest monthly amount, 1.40, occurred at Prescott, while none fell at a great number of stations.

The principal farming operations of the season are plowing and seeding. The work is very backward on account of the dry and hard condition of the soil, owing to lack of rainfall and a deficient supply of water for irrigation. The gathering of the orange crop was begun the latter part of the month. The yield is below the average.—*Wm. G. Burns.*

Arkansas.—The mean temperature was 50.5°, or about normal; the highest was 88°, at Camden on the 2d, and the lowest, 15°, at Pond on the 16th. The average precipitation was 2.99, or 0.81 below normal; the greatest monthly amount, 4.83, occurred at Mossville, and the least, 1.57, at Corning.

The weather during the month has been generally favorable for wheat; the early sown has generally come up to good stands and looks healthy and vigorous. In some localities the stands are not so good, having been injured by the hessian fly and other insects and the drought. The late sown is much better; the timely rains have been of great benefit and have given it a good start. There have been no severe freezes or frosts sufficiently heavy to damage it. Fall oats and rye are generally up to good stands and are looking well.—*Edward B. Richards.*

California.—The mean temperature was 54.9°, or 2.5° above normal; the highest was 100°, at Craftonville on the 6th, and the lowest, 5°, at Bodie on the 11th. The average precipitation was 2.65, or 0.46 above normal; the greatest monthly amount, 12.85, occurred at Upper Mattole, while none fell at ten stations.

Conditions were favorable for farming operations; no injurious frosts occurred. The rainfall was slightly in excess of the normal, particularly in the central and northern sections, but was deficient in southern California. The rain was very beneficial to early sown grain and pasturage, and caused but little damage to late fall crops.—*Alexander G. McAdie.*

Colorado.—The mean temperature was 40.0°, or 4.8° above normal; the highest was 88°, at Holyoke on the 4th, and the lowest, 3° below zero, at Moraine on the 19th and at Breckenridge on the 12th and 25th. The average precipitation was 0.22, or about one-fourth the normal amount; the greatest monthly amount, 1.60, occurred at Ruby, while none fell at a number of stations.—*F. H. Brandenburg.*

Cuba.—The mean temperature was 72.2°; the highest was 95°, at San Cayetano on the 8th, and the lowest, 40°, at Central Rosario (Aguacate) on the 22d. The average precipitation was 0.83; the greatest monthly amount, 8.25, occurred at Central Sta. Lucia (Gibara), while none fell at numerous points in the provinces of Pinar del Rio, Havana, Matanzas, and Santa Clara.

The temperature was unusually uniform, but was generally below normal throughout the month. In Santiago de Cuba Province light rains fell with a fair degree of frequency, but over the remainder of the island extremely dry weather prevailed, and numerous localities of the western half of the island received no rain at all. During the first few days of the month both temperature and rainfall conditions were favorable for crops, but their continuance caused this season's cane crop to mature too early and retarded the growth of canes planted last spring and this fall; many tobacco seed beds were entirely ruined, and during the latter part of the month transplanting was impracticable, or was carried on under difficulties, except in those sections with irrigating facilities.—*Montrose W. Hayes.*

Florida.—The mean temperature was 59.1°, or 6.0° below normal; the highest was 90°, at Fort Meade on the 1st and at Hypoluxo on the 3d, and the lowest, 21°, at Wausau on the 17th. The average precipitation was 0.89, or 1.12 below normal; the greatest monthly amount, 2.22, occurred at Titusville, and the least, trace, at Flamingo.

The month was the coldest November since the establishment of the Climate and Crop Service, eleven years ago. Frosts and freezing conditions prevailed over the north half of the State and light frost occurred over the upper portion of the southern district. Considerable damage resulted to vegetables and sugar cane. The month was very dry, the deficiency in precipitation being such as to retard the growth of vegetables and strawberries. Oranges colored nicely and shipments were active.—*A. J. Mitchell.*

Georgia.—The mean temperature was 49.3°, or 5.0° below normal; the highest was 87°, at Fitzgerald and Mauzy on the 1st, and the lowest, 12°, at Greenbush on the 29th. The average precipitation was 0.98, or 1.80 below normal; the greatest monthly amount, 2.58, occurred at Columbus, and the least, 0.10, at Gillsville.

The mean temperature and the average rainfall were the lowest on record for the month during the past eleven years. The weather, although unseasonably cold, was pleasant and invigorating. Rain fell on an average of but four days, and at several stations there was but one day with precipitation. The conditions were unusually favorable for harvesting matured cotton and other late crops. The sowing of fall oats, fall wheat, and rye was retarded by excessive dryness of the soil. Frost formations were exceptionally heavy and numerous.—*J. B. Marbury.*

Idaho.—The mean temperature was 39.4°, or 3.4° above normal; the highest was 78°, at Payette on the 1st, and the lowest, 5°, at Forney on the 11th. The average precipitation was 1.19, or 0.68 below normal; the greatest monthly amount, 5.05, occurred at Murray, and the least, trace, at Blackfoot and Downey.

November was remarkable for excessive temperature and deficient precipitation. The snowfall was light, confined to the high mountains, and disappeared rapidly. October rains caused a fine growth of grass on the stock ranges. The mildness, together with absence of heavy snow, enabled stock to remain on the mountain ranges to within a few days of the close of the month.—*S. M. Blandford.*

Illinois.—The mean temperature was 38.7°, or 1.3° below normal; the highest was 81°, at Centralia on the 1st, and the lowest, 4°, at Dixon

on the 18th. The average precipitation was 1.32, or 1.41 below normal; the greatest monthly amount, 2.40, occurred at Tilden, and the least, 0.50, at Havana.

November was a rather dry month and excellent for carrying on fall and early winter farming operations. The dry weather was not, however, favorable for the germination and growth of fall-sown crops, though wheat is in fairly promising condition. The condition of rye is somewhat less promising. Meadows and pastures have suffered considerably from the heat of the past summer and the dry weather of both summer and fall, and they are generally in poor condition.—*M. E. Blystone.*

Indiana.—The mean temperature was 38.9°, or 2.6° below normal; the highest was 76°, at Mount Vernon on the 1st, and the lowest, 11°, at Hammond on the 5th and at Winamac on the 5th and 8th. The average precipitation was 1.30 or 2.29 below normal; the greatest monthly amount, 2.23, occurred at Hammond, and the least, trace, at Bedford.

Weather conditions were favorable for outdoor work and good progress was made in cribbing corn. The absence of rain was detrimental to growth of wheat and rye. Owing to dryness of ground and to avoid possible damage to plant by insects, much of the wheat was sown late, and the drought continuing, the seed germinated slowly. The plant is short, not well rooted, and the stand is uneven. Rye was sown earlier than wheat in most localities and its condition is fairly good. Pastures failed and stock feeding began earlier than usual.—*W. T. Blythe.*

Iowa.—The mean temperature was 35.8°, or 3.0° above normal; the highest was 77°, at Baxter on the 1st, and the lowest, 2°, at Decorah and Elkader on the 5th. The average precipitation was 0.86, or 0.56 below normal; the greatest monthly amount, 2.30, occurred at Lenox, and the least, 0.20, at Murray.

The month was warmer than usual, with more than the normal amount of clear weather, affording exceptionally favorable conditions for cribbing corn, plowing, and farm operations usual to the season. Some damage resulted to potatoes and late vegetables from severe cold snap of the 3d to 6th, but the balance of the month was not cold enough to retard field work; bulk of corn has been cribbed in fine order. Although the ground is rather dry the fall grain is in good condition to withstand the winter.—*John R. Sage.*

Kansas.—The mean temperature was 44.9°, or 3.6° above normal; the highest was 83°, at Sedan on the 24th, and the lowest, 10°, at Achilles and Colby on the 15th. The average precipitation was 0.65, or 0.20 below normal; the greatest monthly amount, 2.27, occurred at Columbus, while none fell at Coolidge, Garden, Lakin, and Scott.

Unusually warm, dry month, very favorable for outdoor work. Corn mostly cribbed. Apples all gathered, good crop. Wheat continued growing; most of it in fine condition; much in very fine condition and being pastured; much needing moisture at close of month; sowing not finished in the extreme west. Some plowing in southern counties, and some alfalfa being cut for hay.—*T. B. Jennings.*

Kentucky.—The mean temperature was 41.8°, or 3.9° below normal; the highest was 82°, at Greensburg on the 11th, and the lowest, 11°, at Bowling Green and Fords Ferry on the 17th. The average precipitation was 1.52, or 2.44 below normal; the greatest monthly amount, 2.41, occurred at Blandville, and the least, 0.10, at Franklin.

Cool, pleasant weather, with rainfall much below normal. In western portion of State about the usual acreage of winter wheat has been sown and it is in very good condition; in central and eastern portions acreage is low, and cool, dry weather has checked growth, leaving it in rather poor condition. Very little complaint of fly. Rye generally looks better. Tobacco cured nicely, but very little stripping has been done on account of dry weather. Fall grass good in west, but only fair in central and east portions. Stock in fair condition.—*H. B. Hersey.*

Louisiana.—The mean temperature was 56.3°, or 2.5° below normal; the highest was 91°, at Jeanerette on the 1st, 2d, and 3d, and the lowest, 24°, at Collinston on the 15th and Plain Dealing on the 16th. The average precipitation was 2.31, or 1.60 below normal; the greatest monthly amount, 5.61, occurred at Houma, and the least, 0.47, at Sugartown.

The weather during the greater part of the month was favorable for cotton picking. Heavy frost early in the month killed the top crop before it matured. The month opened with favorable weather for sugar cane, and conditions continued exceptionally propitious for this crop until on the 16th and 17th, when low temperatures occurred in the sugar region, with heavy frost to the coast line. Ice formed in exposed places in some of the coast parishes. The bud of the cane was killed generally, and in some localities two or three of the top joints were frozen. Windrowing, while not necessary, was resorted to as a matter of precaution. Cane worked up since the freeze does not show any deterioration. It appears to steadily increase in richness, and the yield of sugar per ton is becoming better and better. The results are generally satisfactory. Rice harvesting was completed in the western parishes, and thrashing nearly completed. The yield has been exceptionally heavy. The bulk of the corn crop has been housed, and the yield is much below the average. Plowing has progressed satisfactorily.—*I. M. Cline.*

Maryland and Delaware.—The mean temperature was 39.2°, or 5.5° below normal; the highest was 76°, at Milford, Del., on the 1st, and the lowest, 4°, at Sunnyside, Md., on the 29th. The average precipitation was 2.68, or 0.45 below normal; the greatest monthly amount, 5.20, occurred at Sunnyside, Md., and the least, 1.43, at Cambridge, Md.

November was a cold, dry, and windy month, except that in the extreme west precipitation was ample. Snowfall was moderately heavy in the mountains, but light elsewhere. Over most of the section scarcely any rain fell until the 23d, when heavy amounts were of general occurrence. The moisture at this time greatly benefited wheat and grass, which were in bad condition, owing to a long dry spell that had lasted since the middle of October.—*Oliver L. Fassig.*

Michigan.—The mean temperature was 33.8°, or 1.7° below normal; the highest was 70°, at Plymouth on the 11th, and the lowest, 4° below zero, at Humboldt on the 5th. The average precipitation was 1.36, or 1.45 below normal; the greatest monthly amount, 4.72, occurred at Lathrop, and the least, 0.10, at Lincoln.

The weather conditions during November were too dry for the best growth of winter wheat, which at the end of the month was small, but healthy and well colored. The lack of precipitation dried up pastures quite rapidly, so that farmers were obliged to feed their stock; the dry conditions, however, were very favorable for corn husking and the delivery of sugar beets to the factories. Wheat seeding has averaged later than ever before, the late seeding being done to avoid the hessian fly; early winter wheat has some fly in it, but the later seeding seems to be affected very little.—*C. F. Schneider.*

Minnesota.—The mean temperature was 28.8°, or 1.0° above normal; the highest was 75°, at Currie on the 2d, and the lowest, 10° below zero, at Warroad on the 24th. The average precipitation was 0.78, or 0.20 below normal; the greatest monthly amount, 2.06, occurred at Two Harbors, and the least, trace, at Crookston and Moorhead.

Many of the lakes were closed by ice early in the month, but the deeper ones were not frozen over till later. There was considerable ice running down the Mississippi on the 15th, and on the 18th the river at Minneapolis was almost entirely frozen over above the falls. Work in the soil was stopped very soon after the beginning of the month by freezing weather, and the only farm work possible since then is that usually done in winter.—*T. S. Outram.*

Mississippi.—The mean temperature was 51.9°, or 3.3° below normal; the highest was 87°, at Poplarville on the 2d, and the lowest, 19°, at Ripley on the 17th. The average precipitation was 2.46, or 1.00 below normal; the greatest monthly amount, 4.22, occurred at Nittayuma, and the least, 1.15, at Okolona.

The month was very favorable for the completion of cotton picking and for fall seeding.—*W. S. Belden.*

Missouri.—The mean temperature was 43.4°, or 1.0° above normal; the highest was 84°, at Zeitonia on the 2d, and the lowest, 9°, at Hannibal on the 17th. The average precipitation was 1.37, or 1.09 below normal; the greatest monthly amount, 4.34, occurred at Mineralspring, and the least, 0.32, at Arthur. For the State, as a whole, it was the driest November during the past 17 years.

In most of the western counties wheat made good progress, and at the close of the month was in a very promising condition, but in nearly all of the central and eastern counties its growth was retarded by the dry weather. In general, however, the crop did well considering the light rainfall. Fall pastures afforded considerable feed in portions of the western and southern sections, but over the greater portion of the State they were very poor.—*A. E. Hackett.*

Montana.—The mean temperature was 36.7°, or 6.2° above normal; the highest was 79°, at Utica on the 27th, and the lowest, 3° below zero, at Culbertson on the 3d. The average precipitation was 0.59, or 0.46 below normal; the greatest monthly amount, 3.36, occurred at Troy, while none fell at Martinsdale.

The weather during the month was very mild, with the precipitation below the normal at all stations, except Fort Benton, Glasgow, Havre, and Poplar.—*E. J. Glass.*

Nebraska.—The mean temperature was 39.5°, or 4.6° above normal; the highest was 85°, at Madrid on the 10th, and the lowest, 8°, at Lynch on the 16th. The average precipitation was 0.50, or 0.17 below normal; the greatest monthly amount, 1.70, occurred at Laclede, while none fell at several places in the western portion of the State.

The high temperature, with sufficient moisture, has been very favorable for the growth of fall-sown grain and for completing fall work.—*G. A. Loveland.*

Nevada.—The mean temperature was 43.1°, or 4.4° above normal; the highest was 80° at Martins Ranch on the 5th, and lowest, 12°, at Owyhee on the 11th. The average precipitation was 0.53, or 0.12 below normal; the greatest monthly amount, 3.30, occurred at Lewers Ranch, and the least, trace, at several stations.

The weather conditions and pasturage were very favorable to stock interests.—*J. H. Smith.*

New England.—The mean temperature was 32.7°, or 4.4° below normal; the highest was 72°, at Flagstaff, Me., on the 1st, and the lowest, 9° below zero at Flagstaff on the 12th. The average precipitation was 2.20, or 1.72 below normal; the greatest monthly amount, 5.71, occurred at Enosburg Falls, Vt., and the least, 0.48, at Chatham, N. H.

Much cloudiness, although the precipitation for the month was below normal. In many sections the water is low in streams, springs, and wells, and rain is needed. The mean temperature was phenomenally low, making the coldest November for many years. A severe storm

passed over the district on the 24–25th, accompanied by high and destructive winds and heavy precipitation. Generally speaking, November was an unpleasant month.—*J. W. Smith.*

New Jersey.—The mean temperature was 38.5°, or 5.0° below normal; the highest was 69°, at Egg Harbor City and Toms River on the 1st, and at Cape May C. H. and Tuckerton on the 2d, and the lowest, 10°, at Chester on the 29th and at Toms River on the 21st and 29th. The average precipitation was 2.38 or 1.61 below normal; the greatest monthly amount, 4.23, occurred at Moorestown, and the least, 1.18, at South Orange.—*Laura M. Dey.*

New Mexico.—The mean temperature was 46.4°, or 2.9° above normal; the highest was 87°, at Carlsbad on the 24th, and the lowest, 11°, at Springer on the 4th. The average precipitation was 1.37, or 0.54 above normal; the greatest monthly amount, 6.15, occurred at Roswell, and the least, 0.01, at San Marcial.

The warm weather and absence of severe frosts made the month unusually favorable for grazing interests.—*R. M. Hardinge.*

New York.—The mean temperature was 32.6°, or 4.7° below normal; the highest was 71°, at Romulus on the 2d, and the lowest, 14° below zero, at Jay on the 29th. The average precipitation was 2.74, or 0.22 below normal; the greatest monthly amount, 7.52, occurred at Number Four, and the least, 0.29, at Catskill.

The first of the month was dry, with moderate temperature, followed by much snow and very cold weather, the month being the coldest November in fourteen years. Grain in the interior of the State is well protected, the depth of snow ranging from 2 inches in the south to 2 feet in parts of the northern section. The weather was favorable for winter grain, which is in good condition, but backward.—*R. G. Allen.*

North Carolina.—The mean temperature was 43.8°, or 5.9° below normal; the highest was 83°, at Southern Pines on the 1st, and the lowest, 7°, at Linville on the 19th. The average precipitation was 1.28, or 1.98 below normal; the greatest monthly amount, 2.75, occurred at Currituck Inlet, and the least, 0.52, at Linville.

Very cold, dry weather prevailed during the month, which was, however, very agreeable for outdoor work on account of the large number of clear days. The mean temperature for the State at large is the lowest on record for November since 1872, and it was also the driest during the same period, with the exception of November, 1890. The prevailing drought delayed the seeding of winter wheat and oats; much wheat failed to germinate or perished for want of moisture, and consequently poor stands are generally reported. Indications point to an increased acreage. The weather was very favorable for gathering the last corn and cotton, and generally for all work except plowing, for which the soil is too dry and hard, but some damage by hessian fly was reported.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 26.8°, or 4.4° above normal; the highest was 70°, at Medora on the 1st, and the lowest, 7° below zero, at McKinney on the 4th. The average precipitation was 0.19, or 0.51 below normal; the greatest monthly amount, 1.02, occurred at Williston, and the least, trace, at Amenia, Cando, Devils Lake, Dunseith, Grafton, Hannaford, Melville, and Willow City.

The month was warm and dry, being very favorable for stacking late-cut hay and for thrashing, of which latter considerable remained unfinished. The absence of snow on the ground allowed stock to pasture on the ranges during the entire month.—*B. H. Bronson.*

Ohio.—The mean temperature was 37.7°, or 3.1° below normal; the highest was 79°, at Sidney on the 1st and at Rittman on the 11th, and the lowest, 10°, at Celina on the 5th and at Bangorville and Rocky Ridge on the 28th. The average precipitation was 1.54, or 1.79 below normal; the greatest monthly amount, 4.24, occurred at Hillhouse, and the least, 0.55, at Jacksonboro.

Wheat made but little progress during the month. It is small and backward in the southern section; somewhat more promising in the middle section, and from fair to good in the northern section. Rye is in fair condition in the north, but poor in the south. Corn husking has progressed slowly but it is not completed. The water supply is very low.—*J. Warren Smith.*

Oklahoma and Indian Territories.—The mean temperature was 51.4°, or 2.7° above normal; the highest was 89°, at Fort Sill on the 1st, and the lowest, 18°, at Blackburn, Ind. T., on the 16th, and Jenkins, Okla., on the 23d. The average precipitation was 1.34, or 0.27 below normal; the greatest monthly amount, 5.10, occurred at Tahlequah, while none fell at Woodward.

The weather during the month was generally dry, with moderate day and cool night temperatures; drought conditions were prevalent, and wheat deteriorated to some extent; generally, the crop continued in fair condition, but needed a soaking rain to advance its growth and supply subsoil moisture. Stock is still pasturing, generally on wheat, and was in fairly good condition at the close of the month, with water very scarce.—*Charles M. Strong.*

Oregon.—The mean temperature was 46.5°, or 3.2° above normal; the highest was 78°, at Junction City on the 4th, and the lowest, 8°, at Beulah and Vale on the 11th. The average precipitation was 5.09, or 1.68 below normal; the greatest monthly amount, 8.10, occurred at Glenora, and the least, 0.15, at Prineville.

The month was unusually mild throughout, the fall rains beginning later than usual. Farm work in the western section of the State was well advanced at the close of the month and fall grain looked thrifty and promising. In the eastern section the dry weather retarded farm work to some extent. In the latter named district early sown fall grain came up unevenly, but the recent rains will greatly benefit it.—*Edward A. Beals.*

Pennsylvania.—The mean temperature was 36.0°, or 4.5° below normal; the highest was 76°, at California on the 1st, and the lowest, 7°, at Center Hall on the 27th. The average precipitation was 2.56, or 1.00 below normal; the greatest monthly amount, 5.00, occurred at Warren, and the least, 1.23, at Wilkesbarre.

Conditions were favorable during most of November for husking corn and securing late crops. The protracted drought delayed plowing somewhat and in some sections injuriously affected the germination of late sown grain and retarded the growth of the early sown. Much of the former was purposely delayed to avoid the hessian fly. The early seeded grain has a healthy appearance and a good stand. Some late fields look bare and thin. The rains during the middle and latter part of the month will be beneficial to grain and grass and have filled up the springs and streams, some of which had become very low.—*T. F. Townsend.*

Porto Rico.—The mean temperature was 76.8°, or 0.8 below normal; the highest was 96°, at Cayey on the 8th, and the lowest 55°, at Adjuntas on the 30th. The average precipitation was 13.62, or 4.11 above normal; the greatest monthly amount, 21.57, occurred at Barros, and the least, 4.11, at Guayama.

The weather during most of the month was decidedly unfavorable for farm work and for all crops except cane. Tobacco beds were badly damaged and some small crops, such as beans, frijoles, etc., completely destroyed. Coffee picking was practically finished, though some difficulty was experienced in cleaning and preparing the berries for market, owing to a lack of sunshine. There was a marked increase in preparations for the new tobacco crop. There was a general scarcity of minor fruits and ground provisions throughout the island. Pastures and stock continue in excellent condition.—*E. C. Thompson.*

South Carolina.—The mean temperature was 48.2°, or 6.0° below normal; the highest was 85°, at Blackville and Temperance on the 1st, and the lowest, 17°, at Walhalla on the 16th, Seivern on the 18th, and Lugoff on the 29th. The average precipitation was 1.01, or 1.84 below normal; the greatest monthly amount, 3.10, occurred at Georgetown, and the least, 0.36, at Walhalla.

The first general killing frost occurred on the 7th, which ended the growing season. The weather, while cool, was favorable for gathering crops, especially cotton, not all of which was picked by the close of the month. The ground was too dry for working well and for favorable germination of wheat and oats. Clay lands were unfit to plow or seed. Along the coast the drought increased in severity and has become alarming, having practically ruined fall and winter truck crops. Wheat seeding has only fairly begun.—*J. W. Bauer.*

South Dakota.—The mean temperature was 34.1°, or 5.0° above normal; the highest was 78°, at Bowdle on the 1st and at Bad Nation on the 10th, and the lowest, 6° below zero at Grand River School on the 7th. The average precipitation was 0.30, or 0.29 below normal; the greatest monthly amount, 1.12, occurred at De Smet, and the least, trace, at Alexandria and Marion.

The month was unusually free from storms, marked cold waves, or heavy snowfalls, and the conditions were generally highly favorable for the completion of autumn, field, and other farm work, and the uninterrupted feeding of live stock on the range. On the whole it was a very pleasant and favorable month.—*S. W. Glenn.*

Tennessee.—The mean temperature was 44.1°, or 3.6° below normal; the highest was 78°, at Tellico Plains on the 1st, and the lowest, 11°, at Rugby, Hohenwald, and Johnsonville on the 17th. The average precipitation was 1.48, or 2.24 below normal; the greatest monthly amount, 2.90, occurred at Tullahoma, and the least, 0.11, at Lynnville.

The month was very dry, cool, and favorable for farm work, which was well advanced at the close of the month. Wheat sowing was nearly finished, though there was some delay through fear of fly; early sowings were up and looking well, with good stands, but growth checked by dry, cool weather; acreage was increased in most sections and the crop put in better than usual. Other winter grains were looking well.—*H. C. Bate.*

Texas.—The mean temperature was 59.0°, or 2.4° above normal; the highest was 94°, at Fort Ringgold on the 1st and 2d and at Jasper on 1st, and the lowest, 19°, at Tyler on the 21st. The average precipitation was 1.63, or 0.51 below normal; the greatest monthly amount, 4.84, occurred at Longview, while none fell at Fort Stockton.

In the west-central counties and along the Rio Grande the prolonged drought continues unbroken, and has become one of great severity. Fall plowing and seeding have progressed under favorable conditions, except where too dry, and the greater part of the latter work has been completed. Where the moisture has been sufficient wheat is up to good stands and making a fine growth, and in some sections the fields are being pastured. From regions where the soil is very dry complaints are made of poor stands and ungerminated seed. General

rains would greatly benefit the condition of wheat and other fall grainl Cotton picking has been completed in all sections, except for smal. scattered patches.—*Edward H. Bowie.*

Utah.—The mean temperature was 41.3°, or 4.0° above normal; the highest was 76°, at Green River on the 1st, St. George on the 3d and 4th, and at Fillmore on the 8th; and the lowest, zero, at Loa on the 11th. The average precipitation was 0.29, or 0.55 below normal; the greatest monthly amount, 1.40, occurred at Heber, while none fell at ten stations.

One of the warmest Novembers on record. The continued dry weather has not been favorable for fall grain. Feed and water are very scarce on the ranges, and as a result sheep are in very poor condition.—*L. H. Murdoch.*

Virginia.—The mean temperature was 41.2°, or 5.6° below normal; the highest was 84°, at Barboursville on the 1st, and the lowest, 11°, at Buckingham and Burkes Garden on the 19th. The average precipitation was 1.48, or 1.31 below normal; the greatest monthly amount, 2.62, occurred at Lincoln, and the least, 0 20, at Newport News.

The month was too cold and dry for the growth or the early seeding of winter grains, also for the germination of late seeding. Many fields seeded to winter wheat late in the season are still bare, and it is thought the seed has rotted. Winter oats and clover behind their average seasonal condition. Fall plowing suspended until after rains of 23–24th.—*Edward A. Evans.*

Washington.—The mean temperature was 44.0°, or 3.3° above normal; the highest was 77°, at Mottinger's on the 4th, and the lowest, 9°, at Wilbur on the 3d. The average precipitation was 6.10, or 0.36 above normal; the greatest monthly amount, 23.68, occurred at Clearwater, and the least, 0.35, at Connell.

The mildness of the month, and sufficiency of rain contributed to the growth of winter wheat, which throughout the month was in very favorable condition. The rain improved pastures and put the soil in good condition for plowing.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 38.0°, or 6.2° below normal; the highest was 79°, at Mannington on the 1st, and the lowest, 7°, at Beverly on the 29th. The average precipitation was 2.51, or 0.63 below normal; the greatest monthly amount, 5.35, occurred at Mannington, and the least, 1.23; at Lewisburg.

At the close of the month, early sown wheat, where not injured by the fly, was in fair condition, but the later sown (and most was such) was in rather poor condition, and some had been killed.—*E. C. Vose.*

Wisconsin.—The mean temperature was 32.0°, or 0.5° below normal; the highest was 73°, at Prairie du Chien on the 12th, and the lowest, 8° below zero, at North Crandon on the 26th. The average precipitation was 0.84, or 0.90 below normal; the greatest monthly amount, 1.87, occurred at Osceola, and the least, 0.22, at Prentice.

The weather during the month was very favorable for winter grains and grasses. Winter wheat amd rye have continued to make good progress and are now generally considered to be in excellent condition. The deficiency in precipitation has caused a low stage of water in most streams, and the soil, especially in the southern portion of the State, is in need of moisture.—*W. M. Wilson.*

Wyoming.—The mean temperature was 37.1°, or 4.7° above normal; the highest was 82°, at Bitter Creek on the 9th, and the lowest, 8° below zero, at Big Piney on the 13th, 18th, and 19th. The average precipitation was 0.32, or 0.31 below normal; the greatest monthly amount, 1.25, occurred at Fort Yellowstone, while none fell at Hyattville.

The month was unusually mild and free from any severe storm. The weather was very favorable for all stock, which is still in excellent condition. The absence of snow prevented many sheep from being moved to winter ranges away from the streams, and compelled them to be fed on the summer ranges, which now furnish poor grazing.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

THE WESTWARD MOVEMENT OF THE DAILY BAROMETRIC WAVE.[1]

By OLIVER L. FASSIG, Ph. D., Section Director, United States Weather Bureau.

The publication, in recent Annual Reports of the Chief of the Weather Bureau, of the hourly values of barometric pressure at a large number of stations in the United States, in the West Indies, and along the north coast of South America affords an excellent opportunity for the study of the diurnal variations of the barometer over a wide area. Reliable hourly observations in the middle and higher latitudes of South America are still few in number. However, by selecting for study the month of July, during which the heat equator is thrown farthest to the north, this lack of data in the Southern Hemisphere is largely remedied. During July there is a nearer approach to similarity in the distribution of land and water to the north and south of the heat equator; hence the conditions which largely influence temperature and pressure changes are more nearly comparable in the Western Hemisphere than they are over the Eastern Hemisphere, where the northern half is mostly land and the southern mostly water.

Until recently the question of the diurnal variation of the barometer has been studied mostly by means of the diurnal curve at isolated stations. In the present treatment of the subject the hourly values, or rather the hourly departures from the average for the day, at about 50 stations have been charted, after being reduced to a common hour, namely, seventy-fifth meridian time. In this way we obtain a view of actual conditions of pressure at the same instant of time over a wide area, similar to that of our daily simultaneous weather charts. Charting the observations in this manner brings to light some relations hitherto but vaguely recognized in the theoretical discussions of the subject.

On the accompanying Charts X–XIII, figs. 1–24, I have plotted the departures from the average daily pressure for each hour of the day and night at stations in North and South America and in the West Indies, together with a few outlying stations. Lines were then drawn connecting stations having equal departures from the accepted normal value for the day, i. e., hourly isoabnormals of pressure. The area covered by the observations extends in longitude from 0° to 140° west of Greenwich; in latitude, from 60° north to 40° south.

Taking up the charts in the order of time, the three most striking features within the area of observation are:

(*a*) The development and westward propagation of an area of pressure above the normal, an anticyclonic area, or perhaps more properly a *wave* of increasing pressure, over the North and South American continents during the forenoon; followed by,

(*b*) The development and westward propagation of an area of pressure below the normal value, or a wave of diminishing pressure during the afternoon; followed by,

(*c*) A period of comparatively uniform distribution of pressure during the night hours, which, upon further study, may be subdivided into two minor periods, namely, a secondary period of high pressure during the first half of the night, followed by a secondary period of low pressure during the second half of the night.

A closer study of the charts under consideration reveals the following characteristics of the principal and the secondary systems of isoabnormals.

(1) The principal area of high pressure.

The area of pressure above the normal of the day appears upon the eastern coast of the United States between 5 and 6 a. m. It increases in extent and strength to 11 a. m. (seventy-fifth meridian), when it reaches a maximum, in July, of about + 0.040 inch over the United States, and of + 0.020 inch over the Gulf of Mexico and the West Indies. Over the South American Continent a maximum of + 0.040 inch is reached about an hour earlier. At the time of maximum development it extends from about 20° to 140° longitude west of Greenwich, and from about 70° north to 60° south latitude, the axis of

[1] Read before the Milwaukee Convention of United States Weather Bureau Officials, August 27, 1901.

the wave being in a NW.-SE. line through the center of the continental areas of the Western Hemisphere. The last traces of the area pass beyond the Pacific coast of the United States about 4 p. m. The entire area passes a given meridian in about eight hours.

(2) The principal area of low pressure.

The principal area of low pressure immediately follows the principal area of high pressure. It appears upon the eastern coast of the United States about 1 p. m., attains a maximum development in the United States at 6 p. m. (seventy-fifth meridian) with a departure of —0.040 inch, and leaves the Pacific coast between 11 p. m. and midnight, the entire area passing a given meridian in about eight hours. Over South America it attains its greatest depth of about —0.060 inch at 5 p. m. (seventy-fifth meridian). In geographic extent, at the time of greatest development, the diameter of the low area measures about 8,000 miles, being equal in area to the high pressure system. The development of low pressure is greatest over the central continental areas during July.

(3) The secondary area of high pressure.

The principal low pressure area is followed during the first half of the night by a secondary area of high pressure, feebly developed over the North American continent during July, but quite well marked over the colder southern continent. Its greatest development is attained between 10 p. m. and 11 p. m. (seventy-fifth meridian), when it covers the entire South American continent and adjacent portions of the Atlantic and Pacific oceans and the eastern portion of the United States. The maximum departure is about +0.030 inch. In geographic extent it has about one-half the area of the primary systems.

(4) The secondary area of low pressure.

The secondary area of high pressure is followed by a secondary area of low pressure. It is equal in geographic extent and in the degree of its development to the secondary area of high pressure, and is most evident about 4 a. m., when it prevails over all of South and North America, with a maximum depression of about —0.020 inch.

The position of the center of the diurnal departure of pressure depends upon the season of the year and upon the relative distribution of land and water.

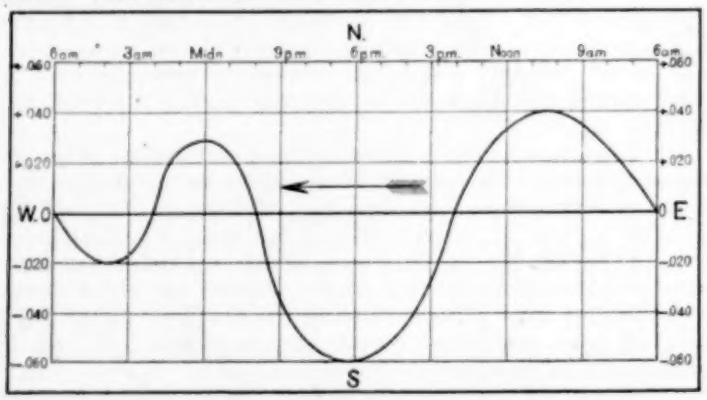

FIG. 1.

The westward propagation of the four areas is represented diagramatically in fig. 1, but is more clearly shown on Charts X–XIII, figs. 1–24.

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Manuel E. Pastrana, Director of the Central Meteorologic-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the Boletin Mensual. An abstract, translated into English measures, is here given, in continuation of the similar tables published in the MONTHLY WEATHER REVIEW since 1896. The barometric means are now reduced to standard gravity.

Mexican data for November, 1901.

Stations.	Altitude.	Mean barometer.*	Temperature. Max.	Min.	Mean.	Relative humidity.	Precipitation.	Prevailing direction. Wind.	Cloud.
	Feet.	*Inch.*	° *F.*	° *F.*	° *F.*	%	*Inch.*		
Chihuahua	4,669	25.34	80.6	37.4	58.3	59	.....	e.	.....
Guadalajara (Obs del. Est.)	5,186	24.99	78.8	48.2	61.5	59	0.15	n.	.....
Guanajuato	6,640	23.71	84.0	36.1	60.4	55	1.15	ene.	.....
Leon (Guanajuato)	5,906	24.32	77.7	35.2	59.0	67	0.37	nw.	.....
Mazatlan	25	29.91	88.0	65.8	75 9	75	.....	nw.	.....
Merida	50	30.03	90.5	52.7	68.4	77	0.38	ne.	.....
Mexico (Obs. Cent.)	7,472	23.06	72.7	39.2	55.8	63	0.54	n.	ne.
Monterrey (Sem.)	1,626	28.30	93.2	44.6	64.9	73	1.32	ne-e.	.....
Morelia (Seminario)	6,401	23.97	74.5	41.2	59.5	71	0.43	e.	.....
Puebla (Col. Cat.)	7,125	23.39	73.4	42.8	59.2	69	1.02	e.	.....
Puebla (Col. d. Est.)	7,118	23.36	75.2	37.9	55.8	65	1.15	ene.	.....
Queretaro	6,070	24.20	79.7	37.9	59.7	63	1.35	e.	.....
Saltillo (Col. S. Juan)	5,309	24.83	75.2	42.8	56.8	76	0.24	n.	.....
S. Isidro (Hac. de Gto)	.....	.....	72.5	55.4	.....	.....	0.54	w.	.....
Toluca	8,812	21.96	72.5	32.5	51.1	65	0.65	n.	.....

* Reduced to standard temperature and gravity.

HAWAIIAN CLIMATOLOGICAL DATA.

By CURTIS J. LYONS, Territorial Meteorologist.

Meteorological observations at Honolulu, November, 1901.

The station is at 21° 18′ N., 157° 50′ W.

Hawaiian standard time is 10h 30m slow of Greenwich time. Honolulu local mean time is 10h 31m slow of Greenwich.

Pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.

The rainfall for twenty-four hours is measured at 9 a. m. local, or 7.31 p. m. Greenwich time, on the respective dates.

The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet, and the barometer 50 feet above sea level.

Date.	Pressure at sea level.	Temperature. Dry bulb.	Wet bulb.	During twenty-four hours preceding 1 p. m., Greenwich time, or 2.29 a. m., Honolulu time. Temperature. Maximum.	Minimum.	Means. Dew-point.	Relative humidity.	Wind. Prevailing direction.	Force.	Average cloudiness.	Sea-level pressures. Maximum.	Minimum.	Total rainfall at 9 a. m., local time.
	*	†	†			‡	‡			§			
1	29.95	71	69	84	70	70.5	79	se-ne.	1	5	30.03	29.94	0.00
2	29.91	70	67.3	82	70	68.0	78	nne.	1-0	2	29.99	29.90	0.00
3	29.94	67	66.3	81	66	69.0	84	sse-n.	1	1-8	29.98	29.89	0.03
4	29.96	71	69	80	67	67.7	86	n.	1-0	6-1	30.01	29.93	0.08
5	29.94	74	68	80	68	67.3	77	nne.	1-3	7-3	30.02	29.93	0.28
6	29.93	75	68.5	81	72	66.5	72	ne.	3-5	7	29.99	29.89	0.12
7	29.90	70	69.3	80	71	66.7	72	ne.	3-5	6	29.98	29.90	0.80
8	29.90	74	69	76	69	68.5	86	ene.	4-5	9	29.94	29.86	0.78
9	29.95	75	69.5	79	72	68.0	77	ne.	5-6	8	30.00	29.89	0.41
10	30.00	76	70	77	74	67.0	76	ene.	4	10	30.04	29.96	0.37
11	29.98	74	71	79	73	68.0	76	ne.	4-6	10	30.04	29.95	0.03
12	29.99	74	69	79	73	68.7	77	ne.	5-4	10-3	30.04	29.97	0.04
13	30.00	72	66.5	78	73	68.0	78	ne.	5-4	8	30.04	29.95	0.00
14	30.05	71	63.5	77	72	65.0	74	nne.	3	10	30.06	29.96	0.27
15	30.07	73	64.5	76	68	60.7	65	ne.	5	9-6	30.13	30.03	0.01
16	30.04	74	65.5	77	69	61.7	65	ne.	5	4	30.13	30.03	0.00
17	30.02	74	66.5	77	71	63.3	68	ne.	4	6	30.07	29.97	0.03
18	30.04	72	68	78	73	64.0	68	ne.	5-4	4	30.07	29.99	0.03
19	30.05	74	70	79	70	67.0	78	ene.	3-1	6-3	30.14	30.01	0.01
20	30.04	70	68.5	80	70	69.0	78	ene.	3	4	30.09	29.99	0.00
21	30.01	67	65.7	81	68	68.3	83	nne.	1	1-4	30.07	29.97	0.00
22	29.99	72	68	80	66	66.0	78	ne.	1	2-6	30.03	29.94	0.00
23	30.01	72	69	80	66	66.7	75	ne.	2	6-3	30.05	29.96	0.02
24	30.01	74	68	79	70	66.7	77	ne.	2	6-3	30.07	29.98	0.00
25	29.98	72	67.5	79	72	64.0	68	ne.	3-2	3	30.07	29.96	0.00
26	29.97	68	65	77	68	66.3	79	nne.	1	6-8	30.02	29.95	0.01
27	29.90	69	66.5	78	63	63.3	74	n.	1	1-10	29.99	29.89	0.00
28	29.88	65	63.7	79	65	61.5	79	n.	1-0	2-0	29.95	29.85	0.02
29	29.90	66	65.3	79	63	65.3	82	n.	1-0	0-4	29.93	29.85	0.00
30	29.95	65	63.7	79	65	66.0	84	w.	1-0	7-0	29.97	29.87	0.00
Sums..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3.34
Means.	29.975	71.4	67.4	78.9	69.0	66.2	76.5	.....	2.6	5.5	30.030	29.939	.....
Departure..	+.026	.....	.....	.....	.....	+0.5	+0.5	.....	.....	+0.9	.....	.....	.....

*This pressure is as recorded at 1 p. m., Greenwich time. †These temperatures are observed at 6 a. m., local, or 4:31 p. m., Greenwich time. ‡These values are the means of (6+9+2+9) ÷ 4. §Beaufort scale.

Mean temperature for November, 1901 (6 + 2 + 9) = 73.9; normal is 73.8. Mean pressure for November, 1901 (9 + 3) ÷ 2 = 29.983; normal is 29.957.

Rainfall data.

Stations.	Elevation.	Oct., 1901.	Stations.	Elevation.	Oct., 1901.
HAWAII.			MAUI—*Continued.*		
HILO, e. and ne.	*Feet.*	*Inches.*	Haleakala Ranch, n	2,000	0.65
Waiakea	50	11.60	Wailuku	200	0.42
Hilo (town)	100	9.51	LANAI.		
Kaumana	1,250	15.99	Keomuku, e.	6	.....
Pepeekeo	100	9.03	OAHU.		
Hakalau	200	.....	Punahou (W. B), sw.	47	4.14
Honohina	300	.....	Kulaokahua, sw.	50	3.56
Laupahoehoe	500	.....	Makiki Reservoir	120	3.84
Ookala	400	5.94	Kewalo (King street), sw.	15	3.77
HAMAKUA, ne			U. S. Naval Station, sw	6	2.92
Kukaiau	250	4.90	Kapiolani Park, sw.	10	3.02
Paauilo	750	....	Manoa (Woodlawn Dairy), e.	285	8.20
Paauhau Mill (Gibb)	300	2.73	School street (Bishop), sw.	50	.....
Paauhau (Greig)	1,150	....	Pacific Heights, sw.	700	4.94
Honokaa (Muir)	425	2.56	Insane Asylum, sw.	30	3.08
Honokaa (Rickard)	1,900	....	Kalihi-uka	260	.....
Kukuihaele	700	2.72	Kamehameha School	75	.....
KOHALA, n.			Nuuanu (W. W. Hall), sw.	50	3.66
Awini Ranch	1,100	.....	Nuuanu (Wylie street), sw.	250	.....
Niulii	200	4.44	Nuuanu (Elec. Station), sw.	405	5.80
Kohala (Mission)	521	3.54	Nuuanu (Luakaha) c.	850	10.76
Kohala (Sugar Co.)	235	4.72	Waimanalo, ne.	25	2.14
Hawi	300	.....	Maunawili, ne	300	4.17
Hawi Mill	600	.....	Kaneohe, ne.	100	.....
Waimea, e	2,720	0.70	Ahuimanu, ne.	350	6.53
KONA, w.			Kahuku, n	25	1.47
Kailua	950	2.72	Waialua, n	20	1.60
Holualoa	1,350	2.54	Wahiawa, c.	900	2.68
Kealakekua	1,580	3.64	Ewa Plantation, s.	60	3.85
Napoopoo	25	.....	Waipahu, s.	200	4.64
KAU, se.			Moanalua, sw.	15	4.47
Kahuku Ranch	1,680	10.00	KAUAI.		
Honuapo	15	4.59	Lihue (Grove Farm), e.	200	10.20
Naalehu	650	7.78	Lihue (Molokoa), e.	300	11.90
Hilea	310	9.10	Lihue (Kukaua), e.	1,000	14.28
Pahala	850	5.54	Kealia, e.	15	8.16
Moaula	1,700	15.41	Kilauea, ne.	325	5.79
PUNA, e			Hanalei, n	10	7.87
Volcano House	4,000	6.66	Waiawa, sw.	32	0.05
Olaa	1,700	13.08	Eleele, s.	200	1.24
Olaa	.....	.....	Waiawa, Mountain, s.	2,100	16.14
Kapoho	110	.....	McBryde (Residence)	850	4.66
Kalapana, se.	8	....	Lawai	450	6.98
MAUI.					
Lahaina	...	.....	Too late for last report—		
Waiopae Ranch	700	1.99	Kahuku Ranch	.....	2.41
Kaupo (Mokulau), s	285	5.17	Kailua	.....	4.98
Kipahulu, s.	300	4.86	Waiopae	.....	0.44
Kahikinui	1,550	....	Haleakala Ranch	.....	0.98
Hamoa Plantation, se	60	2.98	Laupahoehoe	.....	1.97
Nahiku (Anderson), ne	60	5.69	Hakalau	.....	5.31
Nahiku, (Nishwitz), ne	800	10.39	Honohina	.....	4.08
Haiku, n	700	4.28	Eleele	.....	0.48
Kula (Erehwon), n	4,500	0.17	McBryde	.....	1.90
Kula (Waiakoa)	2,700	0.01	Puuomalei	.....	0.82
Puuomalei, n	1,400	3.22	Hawi Mill	.....	0.77
Paia, n	180	1.06			

GENERAL SUMMARY FOR OCTOBER, 1901.

Temperature mean for the month, 75.8°; normal, 76.3°; average daily maximum, 81.9°; average daily minimum, 70.5°; average daily range, 11.4°; greatest daily range, 17°; least daily range, 5°; highest temperature, 84°; lowest, 66°.

Barometer average, 29.950; normal, 29.966; highest, 30.06; lowest, 29.81; greatest 24-hour change, .10. Lows passed this point on the 1st, 10th, and 23d; highs, on the 7th, 19th, and 28th. It will be interesting to note whether seven successive months of low barometer will be followed by unusually heavy rains.

Relative humidity, 76.0 per cent; normal, 72.5; mean dew-point, 67.8; normal, 66.1; mean absolute moisture, 7.45 grains to the cubic foot; normal, 7.06.

Rainfall, 4.14 inches; normal, 2.46; rain record days, 22; normal, 19; greatest rainfall in one day, 2.79, on the 2d; total at Luakaha, 10.76; at Kapiolani Park, 3.12. Total rainfall since January 1, 28.96; normal, 27.24.

The artesian well water stands at 33.12 feet above mean sea level. At the same date in 1900 it stood at 33.19. The average daily mean sea level for October was 10.37 feet on the scale; 10.00 representing an assumed annual mean, and 9.82 the actual annual mean for nine years previous to 1901.

Trade wind days, 24 (8 of north-northeast), normal, 22; average force (during daylight) Beaufort scale, 2.3. Cloudiness, tenths of sky, 4.7; normal, 4.3.

Approximate percentages of district rainfall as compared with normal: Hilo, 90 per cent; Hamakua, 75; Kohala, 120; Waimea, 23; Kona, 64; Kau, 375; Puna, 100; Maui, varying all the way from 10 to 100; Oahu, 80 to 175; South Kauai, 300; North Kauai, 120. The drought in North Hawaii, viz, in Hamakua and Kohala, was broken by rains setting in on the 21st. Later indications are of varying winds and abundant rain. Hilea, Kau, had 7.50 inches in twenty-four hours, ending 31st; other Kau stations nearly as much.

Mean temperatures: Pepeekeo, Hilo district, 100 feet elevation, average maximum, 80.1°; average minimum, 69.9°; Waimea, Hawaii, 2,730 elevation, 77.6° and 65.4°; Kohala, 521 feet elevation, 81.5° and 70.7°; Walakoa, Kula, Maui, 2,700 elevation, 81.3° and 60.6°; Kulaokahua, W. R. Castle's 60 feet elevation, highest, 88°; lowest, 67.5°; mean, 75.7°; Ewa Mill, 50 feet elevation, average maximum 85.6°; average minimum, 68.6°; probable mean, 76.4°.

The principal event of the month was the setting in of rains on the 21st on Hawaii Island. The storm of the 3d was singularly confined to Kauai and Oahu. A heavy swell set in on windward coasts at the end of the month. Slight snow fell on Mauna Kea on the 29th. Light earthquake was felt at Kohala, 3 a. m. 15th. Thunder and lightning accompanied by heavy rains on Maui on the 30th.

NOTE.—In view of the remark made in the above report as to continuous low barometer and probable sequel, it may be interesting to know that torrential rains were falling on the island of Hawaii before that report appeared in print. Twenty-five inches in forty-eight hours are officially reported from Hilo[1], and verbal report gives 30 inches in two days at Olaa.

CLIMATOLOGICAL DATA FOR JAMAICA.

Through the kindness of Mr. Maxwell Hall, the following data are offered to the MONTHLY WEATHER REVIEW in advance of the publication of the regular monthly weather report for Jamaica:

Jamaica, W. I., climatological data, October, 1901.

		Negril Point Lighthouse.	Morant Point Lighthouse.
Latitude (north)		18° 15′	17° 55′
Longitude (west)		78° 23′	76° 10′
Elevation (feet)		33	8
Mean barometer	7 a. m.	29.857	29.844
	3 p. m.	29.975	29.788
Mean temperature	7 a. m	79.9	.....
	3 p. m	84.3	.....
Mean of maxima		87.0	.....
Mean of minima		74.2	.....
Highest maximum		89.0	.....
Lowest minimum		71.0	.....
Mean dew-point	7 a. m	74.3	.....
	3 p. m	73.8	.....
Mean relative humidity	7 a. m.	83.0	.....
	3 p. m.	71.0	.....
Total rainfall (inches)		3.44	9.15
Average wind direction	7 a. m	nne.	n.
	3 p. m	nne.	nne.
Average hourly velocity, miles	7 a. m	6.2	5.9
	3 p. m	10.6	9.9
Average cloudiness (tenths):			
7 a. m.	Lower clouds	0.3	1.4
	Middle clouds	2.4	1.4
	Upper clouds	2.7	1.0
3 p. m.	Lower clouds	0.6	1.8
	Middle clouds	5.5	2.1
	Upper clouds	0.7	1.1

NOTE.—The pressures are reduced to standard temperature and gravity, to the Kew standard, and to mean sea level. The thermometers are exposed in Stevenson screens.

[1] November 8–9.

Comparative table of rainfall for October.
(Based upon the average stations only.)

Divisions.	Relative area.	Number of stations.	Rainfall.	
			Average.	1901.
			Inches.	*Inches.*
Northeastern division	25	21	15.12	12.99
Northern and subcentral division	22	52	7.81	7.92
Western-central division	26	22	13.42	9.09
Southern division	27	32	12.37	9.02
General means	100	127	12.18	9.76

In taking the average rainfall Mr. Hall uses only those stations for which he has several years of observation, so that the column of averages represents fairly well the normal rainfall for each division, while the column for the current month represents the average rainfall at those same stations. The relative areas of the divisions are very nearly the same and are given in the preceding table as expressed in percentages of the total area of Jamaica. The number of rainfall stations utilized in each area varies slightly from month to month, according as returns have come in promptly or not, but will not differ greatly from the numbers in the second column of the table.

Jamaica, W. I, climatological data, November. 1901.

	Negril Point Lighthouse.	Morant Point Lighthouse.
Latitude (north)	18° 15′	17° 55′
Longitude (west)	78° 23′	76° 10′
Elevation (feet)	33	8
Mean barometer, 7 a. m.	29.918	29.906
Mean barometer, 3 p. m.	29.864	29.860
Mean temperature, 7 a. m.	76.3	.....
Mean temperature, 3 p. m.	83.1	.....
Mean of maxima	85.9	.....
Mean of minima	73.6	.....
Highest maximum	89.0	.....
Lowest minimum	64.0	.....
Mean dew-point, 7 a. m.	70.0	.....
Mean dew-point, 3 p. m.	71.1	.....
Mean relative humidity, 7 a. m.	81.0	.....
Mean relative humidity, 3 p. m.	67.0	.....
Total rainfall (inches)	0.79	11.40
Average wind direction, 7 a. m.	nne.	n., nne.
Average wind direction, 3 p. m.	n., nne.	n., nne.
Average hourly velocity, miles, 7 a. m	10.7	14.2
Average hourly velocity, miles, 3 p. m	15.7	15.1
Average cloudiness (tenths):		
7 a. m. Lower clouds	0.6	1.5
7 a. m. Middle clouds	2.3	2.2
7 a. m. Upper clouds	3.5	1.2
3 p. m. Lower clouds	0.0	2.8
3 p. m. Middle clouds	5.6	1.9
3 p. m. Upper clouds	1.5	0.9

NOTE.—The pressures are reduced to standard temperatures and gravity, to the Kew standard, and to mean sea level. The thermometers are exposed in Stevenson screens.

Comparative table of rainfall for November.
(Based upon the average stations only.)

Divisions.	Relative area.	Number of stations.	Rainfall.	
			Average.	1901.
			Inches.	*Inches.*
Northeastern division	25	21	10.91	23.14
Northern and subcentral division	22	52	5.73	8.97
Western-central division	26	29	6.06	4.36
Southern division	27	31	4.73	3.62
General means	100	134	6.86	10.02

CUMULUS CLOUDS FORMED BY SMOKE.

By W. H. MITCHELL, Bayonne, N. J.

During the field maneuvers and meteorological kite ascension of the Bayonne kite corps at their field station, November 28, 1901, a large column of smoke was observed to the northward.

It was 11:30 a. m. when the smoke was first noticed, and while the members were speculating as to the location of the fire the crest of the smoke column suddenly became capped with the white vapor of the cumulus cloud formation.

Afterward the smoke evidently rose higher than the white vapor between the observers and the new formed cloud so that for a few moments it was invisible, only to reappear later.

Finally the smoke dissipated, leaving the new formed cloud alone in the northern sky, and increasing in size. It was visible for nearly two hours before it finally disappeared from view.

The fire was slightly west of north from Bayonne and several miles distant. The minimum temperature of the day at Bergen Point was 18°, the maximum 27°. Sky absolutely clear at the time.

CLIMATOLOGY OF COSTA RICA.

Communicated by H. PITTIER, Director, Physical Geographic Institute.

TABLE 1.—*Hourly observations at the Observatory, San Jose de Costa Rica, during November,* 1901.

Hours.	Pressure.		Temperature.		Relative humidity.		Rainfall.		
	Observed, 1901.	Normal, 1889-1900.	Observed, 1901.	Normal, 1889-1900.	Observed, 1901.	Normal, 1889-1900.	Observed, 1901.	Normal, 1889-1900.	Duration, 1901.
	660+ *Mm.*	660+ *Mm.*	° *C.*	° *C.*	%	%	*Mm.*	*Mm.*	*Hrs.*
1 a. m.	4.38	3.10	16.64	17.05	89	92	8.8	2.0	3.66
2 a. m.	4.01	2.73	16.47	16.81	88	92	6.0	2.0	5.00
3 a. m.	3.77	2.60	16.24	16.65	88	92	8.5	1.1	4.08
4 a. m.	3.77	2.54	16.20	16.53	89	92	11.5	0.7	3.92
5 a. m.	3.98	2.80	16.15	16.44	88	92	6.9	1.1	3.00
6 a. m.	4.33	3.23	16.10	16.38	89	91	4.4	2.7	3.00
7 a. m.	4.70	3.57	17.45	17.68	82	86	3.2	0.3	3.00
8 a. m.	5.00	3.98	18.90	19.52	76	80	3.6	1.2	3.00
9 a. m.	5.16	4.18	20.37	21.49	73	75	1.0	1.8	1.42
10 a. m.	5.14	4.08	21.63	23.03	71	70	1.9	1.3	1.17
11 a. m.	4.79	3.75	22.38	23.75	70	70	2.4	2.1	1.83
12 m.	4.19	3.15	22.93	24.05	70	70	1.1	2.6	1.33
1 p. m.	3.65	2.57	22.61	23.94	70	71	2.1	7.2	1.67
2 p. m.	3.19	2.05	22.19	23.31	73	74	7.5	14.7	5.00
3 p. m.	3.02	1.85	21.39	22.36	76	77	3.9	20.0	5.41
4 p. m.	3.13	1.97	20.27	21.22	80	81	18.6	18.7	5.99
5 p. m.	3.41	2.24	19.08	20.15	80	85	22.9	19.3	4.16
6 p. m.	3.74	2.66	18.37	19.30	85	87	15.1	21.0	5.08
7 p. m.	4.26	3.19	18.06	18.65	86	89	12.4	10.8	5.06
8 p. m.	4.67	3.62	17.86	18.33	86	89	12.1	8.5	4.27
9 p. m.	5.00	3.92	17.72	18.05	86	90	2.0	5.4	2.50
10 p. m.	5.08	3.99	17.51	17.72	87	91	6.1	4.9	1.67
11 p. m.	5.04	3.86	17.32	17.42	87	91	11.6	2.5	1.24
Midnight	4.80	3.55	16.95	17.19	88	92	9.1	2.4	2.19
Mean	664.26	663.08	18.78	19.44	82	84	.....	.....	.....
Minimum	661.1	659.33	14.0	11.2	53	.....	.....	.....	.....
Maximum	666.9	667.22	29.3	29.0	100	.....	16.4	.....	.....
Total	.....	.....	.....	.....	.....	.....	182.7	154.2	78.65

REMARKS.—The barometer is 1,169 meters above sea level. Readings are corrected for gravity, temperature, and instrumental error. The dry and wet bulb thermometers are 1.5 meters above ground and corrected for instrumental errors. The hourly readings for pressure, wet and dry bulb thermometers, are obtained by means of Richard registering instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The hourly rainfall is as given by Hottinger's self-register, checked once a day. Under maximum, the greatest hourly rainfall for the month is given. The standard rain gage is 1.5 meters above ground. In the Costa Rican system the San Jose local time is used, which is $0^h\ 36^m\ 13.3^s$ slower than seventy-fifth meridian time.

Notes on the weather.—At San Jose the average pressure was above, and the average temperature below the normal, but the maximum temperature was the highest ever recorded for November. The relative humidity was slightly below the normal and the hours of sunshine were only about two-thirds of the normal number. Altogether November was quite abnormal as compared with the usual weather in San Jose at this

period of the year. On the Pacific slope the rainfall was slightly above the normal; on the Atlantic slope heavy showers caused inundations at several places; at Cariblanco, toward the headwaters of the Sarapiqui River, the amount of rainfall was 1,326 millimeters, which is the greatest monthly amount ever recorded at a Costa Rican station.

Notes on earthquakes.—November 1, 6h 34m a. m., light shock, NNW–SSE, intensity II, duration 8 seconds. November 2, 5h 06m a. m., light shock, NNW–SSE, intensity II, duration 6 seconds. November 5, 7h 10m a. m., very light tremors.

TABLE 2.

Time.	Sunshine.		Temperature of the soil at depth of—					Cloudiness observed, 1901.
	Observed, 1901.	Normal, 1889–1900.	0.15 m.	0.30 m.	0.60 m.	1.20 m.	3.00 m.	
	Hours.	*Hours.*	°C.	°C.	°C.	°C.	°C.	
7 a. m.	2.50	4.81	19.60	19.52	20.74	21.26	21.40	66
8 a. m.	11.41	16.82	.....	.....	.....	.....	.....	.....
9 a. m.	13.42	19.65	.....	.....	.....	.....	.....	.....
10 a. m.	11.01	18.29	19.83	19.88	20.77	21.25	.....	79
11 a. m.	9.08	16.69	.....	.....	.....	.....	.....	.....
12 m.	9.83	14.84	.....	.....	.....	.....	.....	.....
1 p. m.	8.91	13.40	20.08	20.02	20.83	21.29	.....	80
2 p. m.	10.18	13.38	.....	.....	.....	.....	.....	.....
3 p. m.	7.31	12.11	.....	.....	.....	.....	.....	.....
4 p. m.	6.00	9.27	20.10	20.02	20.76	21.23	.....	88
5 p. m.	2.64	4.68	.....	.....	.....	.....	.....	.....
6 p. m.	0.17	0.71	.....	.....	.....	.....	.....	.....
7 p. m.	.....	.....	20.09	20.03	20.71	21.22	.....	78
8 p. m.	.....	.....	.....	.....	.....	.....	.....	.....
9 p. m.	.....	.....	.....	.....	.....	.....	.....	.....
10 p. m.	.....	.....	19.99	20.01	20.75	21.22	.....	72
11 p. m.	.....	.....	.....	.....	.....	.....	.....	.....
Midnight.	.....	.....	.....	.....	.....	.....	.....	.....
Mean	.....	.....	19.96	19.98	20.77	21.24	21.40	78
Total	92.46	144.15	.....	.....	.....	.....	.....	.....

TABLE 3.—*Rainfall at stations in Costa Rica, November*, 1901.

Stations.	Amount.	No. rainy days.	Stations.	Amount.	No. rainy days.
	Mm.			*Mm.*	
1. Sipurio (Talamanca)	238	26	14. Juan Vinas	337	22
2. Boca Banano	483	23	15. Santiago	396	27
3. Limon	258	19	16. Paraiso	172	15
4. Swamp Mouth	590	5	17. Las Concavas	219	20
5. Zent	385	17	18. Cartago	193	17
6. Gute Hoffnung*	*	*	19. Tres Rios	204	15
7. Siquirres	567	20	20. S. Francisco G	179	17
8. Guapiles	662	28	21. San Jose	183	18
9. Sarapiqui	1,326	27	22. La Verbena	461	14
10. San Carlos	545	21	23. Nuestro Amo	118	11
11. Las Lomas	604	18	24. Alajuela	210	11
12. Peralta	372	19	25. San Isidro Alajuela	271	16
13. Turrialba	329	19	26. Cachi	194	15

*Not received.

THE REDUCTION OF RECORDS OF RAIN GAGES.

By Prof. MARK S. W. JEFFERSON, State Normal College, Ypsilanti, Mich., dated December 4, 1901.

The time has come to apply corrections to readings of rain gages before entering the figures on maps or tables that are meant to give information about the distribution of actual rainfall. The work of determining these corrections should be given to men of special training in meteorology, with time for the work and abundant data of such sort as have been hitherto collected.

The mere accumulation of rain gage readings is no longer acceptable to students. Additional observations ought to give greater and greater accuracy to our knowledge, and this is not true of lengthening series of observations in which large and varying errors have been allowed to remain.

We must look to Government bureaus for systematic quantitative studies and to students who have ready access to large libraries for their elaboration and the development of statements of law.

The fact that rain catch diminishes in some proportion to strength of wind is quite certain and it now only remains to apply such empirical corrections as the very interesting one suggested on page 182 of the Editor's paper[1] on "The determination of the true amount of precipitation." It would seem to be proper to apply that formula, as he suggests, to all the individual rains of a locality, to see if there is the expected elimination of local and annual discordances.

There must be abundant data in the office of the Weather Bureau for such investigations, and the prevalent use of city house tops as gage stations would seem to demand the application of corrections. I hope some further studies will be made.

I believe a more serious defect in published rainfall data is connected with the principle involved in atmospheric precipitation in general, i. e., that hill precipitation must tend to exceed that of neighboring lowlands. Of course all the officials of the Bureau are perfectly familiar with this fact, but the publications of the Bureau do not show that it is properly kept in mind. Maps should not be labeled normal annual precipitation if they represent merely low gage collections. A geographer must distinguish mountain masses by deeper shades on a rainfall map, whether gages have ever been set up on their summits or not, since never has a mountain been gaged without yielding greater rainfall than the valleys.

Mr. Gannett drew a rainfall map for Mr. Newell's "Results of stream measurements," Fourteenth Annual Report United States Geological Survey, 1892–93, p. 152, which looks far more satisfactory in this respect than the Mean Annual Precipitation Map in the Report of the Chief of the Weather Bureau, 1896–97, p. 320. Mr. Gannett's data were obtained from the Weather Bureau, and perhaps the Bureau's maps of the same date were better than the later ones. This superiority I find on Mr. Gannett's map, in spite of its smallness, in the representation of the precipitation of the Adirondacks and the White Mountains; it also shows the influence of topography in Oregon, Washington, and Colorado. If the later map (1896–97) is to be believed, subsequent observations must have shown Gannett's map to be in error.

We are not limited to rain gages for our knowledge of rainfall. Table V, on page 358 in the Weather Bureau Report for 1896–97 above referred to, gives figures for eleven New England stations which may be supposed to represent the data from which the map is constructed. Now these stations are at elevations varying between 11 and 850 feet, an average of 175 feet above the level of the sea. It is at once clear that this is far below the average elevation of New England, and must represent considerably less than the average rainfall. On page 359 we find the statement—

> While the mountain system of New England does not greatly modify the rainfall conditions, it plays an important part in the water supply of the towns and cities that cluster along the larger rivers. Virgin forest covers in great part the mountain slopes over a considerable area, thus conserving to a certain extent the rains of summer and the snows of winter.

The rainfall conditions referred to are plainly those of the valleys, and only the low valleys at that. The propriety of assuming these low valleys as typical of New England is evident in one sense only, that of being the seat of population. For agriculture and forest growth the mountains do greatly modify rainfall conditions, since if the mountains were not there the rainfall would be very much less. On the next page we learn that Mount Washington has 83.5 inches, with "some uncertainty attached to these figures owing to the well known difficulties experienced in measuring precipita-

[1] Extract from Bulletin No. 7, Forestry Division, United States Department of Agriculture. See also MONTHLY WEATHER REVIEW, October, 1899, Vol. XXVII, p. 464.

tion on mountain tops." This means that it is probably more than 83.5 inches, and considerably more since the wind velocity is very great. Mount Killington, Vt., has measures suggesting over 55 inches annually. It would seem that the average elevation should be determined, and by a comparison of such gage readings as are obtainable the probable values of rainfall be estimated. Such an estimate would be far more accurate and scientific than the customary presentation of figures that are inapplicable to the facts. This is the St. Kitts-Antigua story over again. The gages may say that their precipitation is the same but the statements need qualification. Another case of this neglect of the influence of geography occurs on page 339 of the same report.

The rainfall in the narrow gorge where the Columbia River breaks through the Cascade Range is also heavy, but this is undoubtedly due to local causes. A similar case of very heavy precipitation at a single isolated station is that of Glenora, on the summit of the Coast Range, in Tillamook County, about 30 miles from the ocean. At this place the annual fall in 1896 was 169 inches, probably the greatest rainfall ever recorded in the United States in a single year.

It would seem clear from these two cases that the crest of the range has a very great precipitation, as was to be expected, and at the only two points in the line of the crest where gages are located this large value is measured. The gages may be isolated but the areas are probably continuous along the summit of the range. The causes are of world-wide application.

The maps of the rainfall of India and of Austro-Hungary show almost perfect reproduction of the topography, and I believe that our knowledge of rainfall everywhere will lead us toward similar results as it becomes more perfect.

Dr. B. A. Gould selected Cordoba, Argentina, for his astronomical observatory on the strength of its small rainfall. But to his disappointment the near presence of a mountain range gave Cordoba a cloudiness out of proportion to this rainfall. The city's existence depends on the river (Rio Primero) which is so entirely dependent on the considerable rainfall in the mountains that it disappears in the sand a little farther east. There is a fringe of country all about these mountains watered by streams from the range which are soon lost in the plains. The climatic conditions of this fringe of country are not adequately represented by a statement of local rainfall only. Nor is the increased amount of rainfall on the fringe all that is due to the influence of the presence of the mountains. The moisture content of the ground is immensely important, and is directly increased by a mountain rainfall in the neighborhood.

The association of forests with mountains has not been sufficiently dwelt upon, yet it is well known that mountains are typically forest clad. The Black Hills and Black Forest are commonly cited as referring to this association by their very names. Homer refers to the mountains whenever he wishes to speak of trees, and Virgil's regular phrase for speaking of the forest is *in montibus*, which is perfectly matched in modern Spanish by the word *monte* which regularly now means *woods* and *not* hills. Jorge Isaacs, in the United States of Colombia, calls the forest "La Montaña." And these forests are there because of rain.

I am much interested in stream run off and vegetative transpiration and evaporation at present. Real knowledge of rainfall is necessary to these studies. Two lines of advance seem open.

(1) The modification of existing rainfall data by such correction for elevation above ground, and wind force at the mouth of the gage as may be now applied.

(2) The preparation of self-registering gages that may facilitate mountain observations by requiring only occasional visits by the observer.

Possibly some help may be had indirectly by comparing the run off in inches of the Cochichuate and Mystic Lake watersheds with that of the Merrimac for the same period, as the small areas of the former are wholly on low levels, while the Merrimac has mountain sources for much of its water. Yet it is likely that direct evaporation is considerably less on the mountain slopes than on the lower ground.

This communication is dictated by my desire to urge meteorologists to pay more attention to modifying influences, like the effect of wind or elevation on rainfall. I wish we could have something better than mean annual rainfall statements in fractions of an inch that are without meaning. The units are unreliable enough under present methods. We are getting gage readings under the name of precipitation, and shall do no better until a systematic correction of known errors is applied and, at least, a partial meteorological exploration of mountain slopes is attempted. But even now we know something about mountain rainfall, and this knowledge should be utilized in drawing precipitation maps, even if in part it be drawn from other sources than a rain gage. Let us not pretend that the White Mountains have become drier because we have now no record of their summit rainfall.

I wish that Congress might authorize the Weather Bureau to investigate this matter thoroughly, as its practical importance is very great.

REMARKS ON THE FOREGOING.

By ALFRED J. HENRY, Professor of Meteorology, in charge of Records Division.

The exposure of the rain gages at the larger Weather Bureau stations is not always as good as might be desired, but it is the best that can be had under the circumstances. The application of a correction to the gage readings before entering them on the records, as suggested by Professor Jefferson, is not considered advisable. Indeed, it is doubtful whether it would ever be advisable to apply corrections to rain gage readings, since such action would involve a determination of the error of each individual gage. The magnitude of this undertaking is readily perceived when we stop to consider that no two roof-exposed gages are identical in their immediate surroundings. In the end the corrected readings would doubtless still be unsatisfactory; it would be much better therefore, both as regards economy of time and labor, to seek a correct exposure at once rather than to attempt to adjust the defective readings. For the forecast work of the Bureau the present gage readings are satisfactory, but for climatic and hydrographic studies more accurate measures of precipitation would be desirable.

The Weather Bureau is no longer dependent, for its climatic work, upon the records of rainfall made on house tops in the large cities. The Climate and Crop Services in the several States and Territories receive monthly reports of rainfall from a large number of stations located mainly in small towns, villages, and on farms. The great majority of the gages at these stations have ground exposures. Moreover, each section director is expected to visit stations in his district and correct faulty exposures when such are suspected to exist.

The concluding part of Professor Jefferson's article is devoted to a criticism of the apparent neglect by the officials of the Bureau of the influence of topography in constructing rainfall maps. He invites attention to a rainfall map prepared by Mr. Henry Gannett, and published in the Annual Report of the United States Geological Survey, 1892–93, and compares it with a map published in the Report of the Chief of the Weather Bureau, 1896–97. The comparison is hardly a fair one, since the last-named map was prepared on a scale altogether too small to admit of distinguishing the higher precipitation of mountain slopes from that of the lowlands.

The purpose of the map published by the Weather Bureau was to show at a glance the broader features of rainfall distribution only, and this it does fairly well.

There is something to be said both for and against the shading of rainfall maps to indicate heavy precipitation on mountain slopes where no actual measurements have been made.

That precipitation increases on mountain slopes up to about 4,000 feet elevation is generally admitted, but what the law of distribution is above that level has not been determined for the mountain regions of the far west. The quantity of rain that falls on a mountain slope is not solely a question of elevation. The angle of incidence that the mountain slope makes with the rain-bearing winds is of much more importance than the absolute elevation. The principle enunciated by Professor Jefferson, viz, that hill precipitation must tend to exceed that of neighboring lowlands, has little, if any, *practical application* in the construction of normal rainfall maps where small differences in elevation are concerned. Let us look for a moment at a few records of hill and valley precipitation, taken from the last published annual report of the New England Climate and Crop Service, viz, that for 1900, page 7. The highest point in Massachusetts at which rainfall observations were made in that year was Pittsfield, in the Berkshire Hills, elevation 1,038 feet. The total annual amount was 46.4 inches. At Williamstown, in the same county, but about 300 feet lower, the total annual precipitation was 46.9 inches, substantially the same as at Pittsfield. Worcester, in the same county, but 500 feet lower than Pittsfield, and 200 feet lower than Williamstown, recorded a total fall of 48.8 inches, an amount greater than either of the hill stations, while Springfield, a valley station, in the same part of the State, with an elevation of 200 feet, gave the largest precipitation of any, viz, 49.8 inches.

In New Hampshire there are three stations with elevations above 1,000 feet. The precipitation at these elevated stations was not so great as at stations much lower. The greatest measured rainfall in the State was at Nashua, Hillsboro County, elevation 125 feet. The same is true of Vermont and Maine, and what is true of a single year is true of other years.

A little reflection will show the folly of attempting to adjust rainfall observations for the supposed influence of elevation in a country of varied topography such as New England.

A final word as to the charge of "neglect of the influence of geography," on page 329, quoted by Professor Jefferson. First as to the facts: The record of heavy rainfall in the gorge of the Columbia was made at Cascade Locks, elevation about 125 feet, by the United States Engineer Corps. The course of the river at that point is nearly east and west, and there is no obstruction to the flow of the winds up and down the valley. The writer is not prepared to say that the heavy rains at Cascade Locks in the river valley are due to the presence of mountains a few miles away on either side of the river. About 35 miles farther up the valley on the east side of the Cascades the average annual rainfall is but 15.8 inches, as against 79.0 inches at Cascade Locks.

It has developed since the rainfall report was written that Glenora, Oreg., is not on the summit of the Coast Range, but has an elevation of probably 1,500 feet or less. The Coast Range in Tillamook County does not, according to the contour maps of the United States Geological Survey attain elevations above 2,000 feet except over small areas.

Additional rainfall stations have been established in Tillamook County within recent years. These all show a very heavy precipitation; thus, Bay City on the east shore of Tillamook Bay (sea level) for the four years, 1897–1900, gives an annual mean of 124 inches. Nehalem, at the mouth of the river of the same name, gives an annual mean of 115 inches (five years). The mean annual precipitation at Glenora (eight years) is 136 inches. This fact alone does not justify us in assuming a higher average precipitation for the length and breadth of the Coast Range in Oregon. What we need is more rainfall stations on the higher levels.

THE TEMPERATURE OF THE SOIL AND THE SURFACE OF THE GROUND.

By DEWEY A. SEELEY, Observer, Weather Bureau, Chicago, Ill.

The importance of soil temperature in agriculture is due both to the beneficial effects of heat in the seed bed and to the destructive effects of frosts upon growing crops. The process of germination will not begin in most cultivated crops until a temperature of 42° or more has been reached and maximum results are attained when the temperature of the soil reaches 68° or 70°. Heat is also necessary to weaken the forces which hold together the food constituents in the soil before they become available for the use of the plant. Nitrification will not take place with the soil temperature below 40°, and is most vigorous at 98°. Again, the osmotic pressure by which the plant food is taken into the plant and forced through the stem to its farthest branch and leaf, is made more effective by heat. On the other hand low temperatures, and especially frost, often cause incalculable damage to vegetation.

Purely local conditions have such a decided influence upon the temperature near the surface of the ground that the effects are apparent to the most casual observer. A heavy frost often occurs over one portion of ground while another portion in close proximity, but under different influences will be entirely free from frost. The local differences in temperature in clear weather with light winds are sufficient to be sensible to a person passing from place to place, especially over hills and valleys.

With the importance of soil temperature in view, and the influence of local conditions so apparent, a few observations were made to determine approximately the effects of some of these local conditions expressed in degrees Fahrenheit.

The first series of observations was made to determine the amount of variation in temperature due to elevation. A low swale surrounded by hills was chosen. Two minimum thermometers were placed on the bare ground, one at the lowest point in the swale and the other on the hilltop about 15 feet above. All conditions, except the elevation, were made as nearly as possible alike. The minimum temperatures, recorded on six clear, still nights in January, were as follows:

Observations.	Temperature in swale.	Temperature on hilltop.
	°	°
1	13	15
2	9.5	10.5
3	8	10.5
4	11.5	16.5
5	2	6
6	−10	− 9
Average.	5.7	8.2

The average of the six readings taken on the hilltop was 2.5° higher than corresponding temperatures below. This difference is important, especially when frosts are liable to occur. In order to determine the difference between the temperature at the surface of the ground and in the free air above, another thermometer, which had been placed on a wooden frame work 30 feet high on the hilltop, was read simultaneously with the above instruments. The average of the six readings of this thermometer was 14.5°, or 6.3° higher than the average on the hilltop, and 8.8° higher than in the swale.

The effects of air drainage upon the temperature of the soil were found to be very decided. Minimum thermometers were placed on the ground; the first in a low swale without air drainage, the second on low ground at about the same elevation as the first but with very good air drainage, and the third on a hill about fifteen feet above. Readings were made on three nights with the conditions favorable for frost, and the results were as follows:

Observations.	Undrained area.	Drained area.	Hilltop.
	°	°	°
1	25	29.5	30
2	40.5	44	44
3	30	34.5	35
Averages.	31.8	36	36.3

These averages show a difference of 4° between low ground with and without air drainage. It so happened that the average of the three readings in the low swale was slightly below the freezing point, while that of the air-drained area was amply above and nearly as high as the average on the hilltop.

A third set of readings was made to determine the effect of vegetation upon the temperature of the surface of the ground on which it was growing. Three minimum thermometers were used, the first being placed on naked soil, the second on the surface of the ground in clover about 2.5 inches high, and the third in grass 6 inches high. The table below shows the remarkable variation in temperature due to the growth of vegetation.

Observations.	Bare ground.	Clover.	Grass.
	°	°	°
1	26	22	16
2	35	30	24
3	29.5	26	21
Averages.	30.2	26	20.3

The average temperature was over 4° lower in the clover and nearly 10° lower in the grass than on the bare ground. These differences in temperature seem incredibly large, but the observations were carefully made and all conditions surrounding the thermometers, except the covering of vegetation, were the same; hence this one element must have been the real cause of the wide variation. In cool weather live stock invariably seeks bare ground to lie down upon, and the above table shows the advantage in so doing. The bare ground absorbs more heat during the day and radiates less heat at night than does the surface covered with vegetation, and hence it is much warmer. Then, too, much more heat is used up in the process of evaporation from plants than from the naked soil. To demonstrate the fact that more water evaporates from soil on which plants are growing, three small tin cups were filled with loam. The first contained simply the soil, the second was filled with the same soil thickly covered with grass about 2 inches high, and the third the same kind of soil in which were growing 12 wheat plants about 10 inches high. Enough water was added each day for ten consecutive days to saturate the soil, the amount being measured by means of a graduated glass tube. The water evaporated from the naked soil was 43 grams; from the grass-covered soil, 72 grams; and from the soil containing wheat, 84 grams, or nearly twice the amount evaporated from the bare soil. The heat used up in evaporating this large amount of water would be sufficient to lower the temperature of the soil several degrees.

Carrying the observations further, it was found that the temperature variations were more dependent upon the height of the plants and their thickness over the surface of the ground than upon the kind of plant. One thermometer was placed in grass about 2 inches high, another in clover about the same height, and a third in grass 8 inches high. The results showed practically no differences between the readings of the first two thermometers, but the third averaged 4° lower.

Even the color of the plant was shown to have an influence upon the temperature. A frost was noticed on one portion of a lawn while another portion of the same lawn was free from it. The portion free from frost was a light-colored June grass, while that on which the frost occurred was a very dark-colored meadow fescue. The lawn was newly mown and the grass everywhere about the same height. Apparently the only cause for one portion having frost and the other not was the color of the grass. The thermometers were carefully placed on the two plots under as nearly similar conditions as possible, and readings were taken each half hour during the night. The temperature averaged over one degree higher on the lighter colored grass. The minimum reached on the dark colored grass was 39°, while 40.5° was the lowest recorded on the light colored grass. Another thermometer was placed on a hard, gravel roadbed near by and read with the other thermometers. This averaged about 10° higher than the one in the dark grass.

The temperature at the surface of the ground is also greatly influenced by the color of the soil. Temperatures taken on dark colored muck, a lighter colored loam, and a very light clay during an afternoon in summer were, respectively, 110°, 101.5°, and 97°. Readings were also taken early the next morning, and the corresponding temperatures were 61.5°, 60°, and 63.5°.

Another important difference in temperature was observed to result from cultivation. Temperatures were taken on soil that had been newly cultivated for seeding and upon soil that had not been worked for several days. Thermometers were placed at the surface of the ground, and at 3, 6, and 12 inches below the surface. These were read at 2:30 p. m. and 2:30 a. m. the following day. The readings are given in the table below:

	Surface.		3 inches.		6 inches.		12 inches.	
	a. m	p. m.	a. m.	p. m.	a. m.	p. m.	a. m.	p. m.
	°	°	°	°	°	°	°	°
Cultivated soil	63	108	65	72	65	68	64	61
Uncultivated soil	60	102	64	77	64	68	62	60

The table shows, first, that the newly cultivated soil was 6° warmer at the surface of the ground than the uncultivated; second, that the temperature 3 inches below the surface was 5.5° higher on the uncultivated soil. These facts show that the newly cultivated soil conducts heat much more slowly than the uncultivated, probably because it is less compact. The amount of evaporation from each is probably about the same for a short time after cultivation, hence this can not be considered as a cause of the difference in temperature. When cultivation is carried on continuously, the surface of the soil is warmer, and the first few inches below the surface cooler, than upon the same soil uncultivated; while at a depth of 6 inches the cultivated soil has the same or a higher temperature than the uncultivated. These are all desirable conditions during the growing season. The warmer surface soil hastens the process of growth in the plant and is a protection against frost. The soil just below the surface being cooler, retards capillarity and thereby retains the soil moisture, while the temperature about the roots of the plant 5 or 6 inches below the surface, is the same or a little higher than on the uncultivated soil. The plan of cultivating the soil about growing crops during the afternoon of a day when the conditions are favorable for frost at night is often recommended, and the table shows that there is much to be gained by so doing. The temperature at the surface of the cultivated soil was 3° higher than on the uncultivated at 2:30 a. m., hence the danger of frost was materially lessened. The heat absorbed during the day is held near the surface of the ground in the cultivated soil, instead of being conducted to lower depths, and the air becomes more moist from the rapid evaporation at the surface, which is a condition unfavorable for the occurrence of frost.

In conclusion, the temperature at the surface of the ground has been shown to be markedly dependent upon local conditions. Many of these local conditions are under the control of man, and a better understanding of them would result in beneficial returns to the agriculturist.

THE SUN-SPOT PERIOD AND THE TEMPERATURE AND RAINFALL OF JAMAICA.

By MAXWELL HALL, Government Meteorologist, dated December 5, 1901.

At Kingston, Jamaica, the usual meteorological instruments were read from June, 1880, to the end of 1886, at 7 a. m., 3 p. m., and 11 p. m., mean local time, and the mean of the three readings was assumed to be the mean of the twenty-four hours. From January, 1887, to March, 1899, when the weather service was closed, the instruments were read at 7 a. m. and 3 p. m. only, and no means for the twenty-four hours were taken.

From the hourly readings of a very fine barograph registering almost continuously by photography, it appears that the above assumption as to the daily averages was correct as far as barometric pressure was concerned, but from the thermograph recently kept by the United States station at Halfway Tree near Kingston, it appears that the assumption was not correct for temperature.

Careful investigation shows that the average daily temperature may be determined by the use of either one of two formulæ, which we will call A and B:

(A) Mean temperature of the 24 hours $= \frac{M+m}{2} - 1°$, where M and m are the maximum and minimum readings, respectively;

(B) Mean temperature of the 24 hours $= \frac{7 \text{ a. m.} + 3 \text{ p. m.}}{2}$,

As we are unable at present to decide which is the better of the two, without hesitation we take at once—

mean temperature of the twenty-four hours $= \frac{A+B}{2}$.

The following table gives the means for the eighteen complete years that the service was in existence; the readings were taken by Mr. Robert Johnstone, and the errors of the instruments were checked from time to time by means of a thermometer verified at Kew, England, three times during the eight years.

The thermometers were placed in a Stevenson's screen on a grass lawn about 50 feet above sea level.

Summary of Kingston mean temperatures for each year.

Year.	24 hours.	7 a. m.	3 p. m.	Max.	Min.	Highest.	Date.	Lowest.	Date.
	°	°	°	°	°	°			
1881	79.0	75.7	84.0	87.2	71.2	93.8	July 7	60.3	Jan. 13
1882	78.8	75.6	84.0	86.4	71.2	92.2	Aug. 27	61.5	Feb. 6
1883	79.0	75.6	84.1	86.8	71.5	93.3	July 28	63.6	Dec. 10
1884	78.5	75.3	83.8	86.3	70.7	92.7	Sept. 18	62.3	Feb. 7
1885	79.4	76.6	84.3	86.9	71.6	95.2	Nov. 6	58.2	Dec. 29
1886	79.5	75.6	84.5	89.0	70.9	96.4	Oct. 1	62.2	Jan. 26
1887	78.4	74.6	83.4	88.3	69.3	93.3	July 21	56.7	Dec. 4
1888	79.4	75.3	85.1	88.9	70.1	94.6	July 28	59.6	Jan. 5
1889	79.7	75.0	85.5	89.5	70.9	94.3	July 28	60.0	Mar. 2
1890	78.2	73.1	84.1	87.9	69.8	94.4	July 21	60.2	Feb. 4
1891	79.0	74.1	84.7	87.5	71.5	96.7	Aug. 20	61.5	Jan. 27
1892	78.1	73.6	83.4	86.7	70.7	94.8	July 11	63.0	Feb. 2
1893	77.9	73.3	83.2	86.5	70.6	92.9	July 4	63.8	*Mar. 17
1894	78.0	73.7	83.3	86.7	70.3	92.9	June 22†	61.2	Mar. 9
1895	78.6	73.7	84.3	87.5	71.0	94.6	Aug. 17	62.8	Dec. 21
1896	79.2	74.2	84.7	87.8	71.9	93.9	July 13	62.7	Jan. 15
1897	79.1	74.2	84.7	87.8	71.7	94.0	Aug. 9	62.0	Jan. 12
1898	78.2	73.3	83.8	86.9	70.7	93.5	Jan. 13	62.6	Nov. 12
Means	78.8	74.6	84.2	87.5	70.8	94.1		61.3	

*And December 7. †And July 17 and September 21.

The first thing to be noticed is the break in the 7 a. m. readings. From 1881 to 1889 the mean is 75.5°; from 1890 to 1898 the mean is 73.7°. During the first nine years the screen was as well exposed as possible; during the last nine years it was exposed on the Parade Gardens, which had been recently planted with ornamental shrubs of all kinds. Of late years these shrubs have grown to be trees, and have caused anxiety as to the exposure of the screen, but it appears that the exposure was bad at first, and has not become worse with the growth of the trees. It is to be noticed, however, that the daily maximum temperatures, which occur shortly after noon, are in no way affected by the ornamental shrubs or trees. The sun is then vertical, or nearly so, and of course the screen is exposed to its full blaze. This also applies to the 3 p. m. readings. Again, the minimum readings have not been affected. It is therefore to be hoped that the mean temperatures, as computed by the formula $\frac{A+B}{2}$, are not greatly in error. But when we look down the maximum column we are surprised to find that the two lowest results occur in 1884

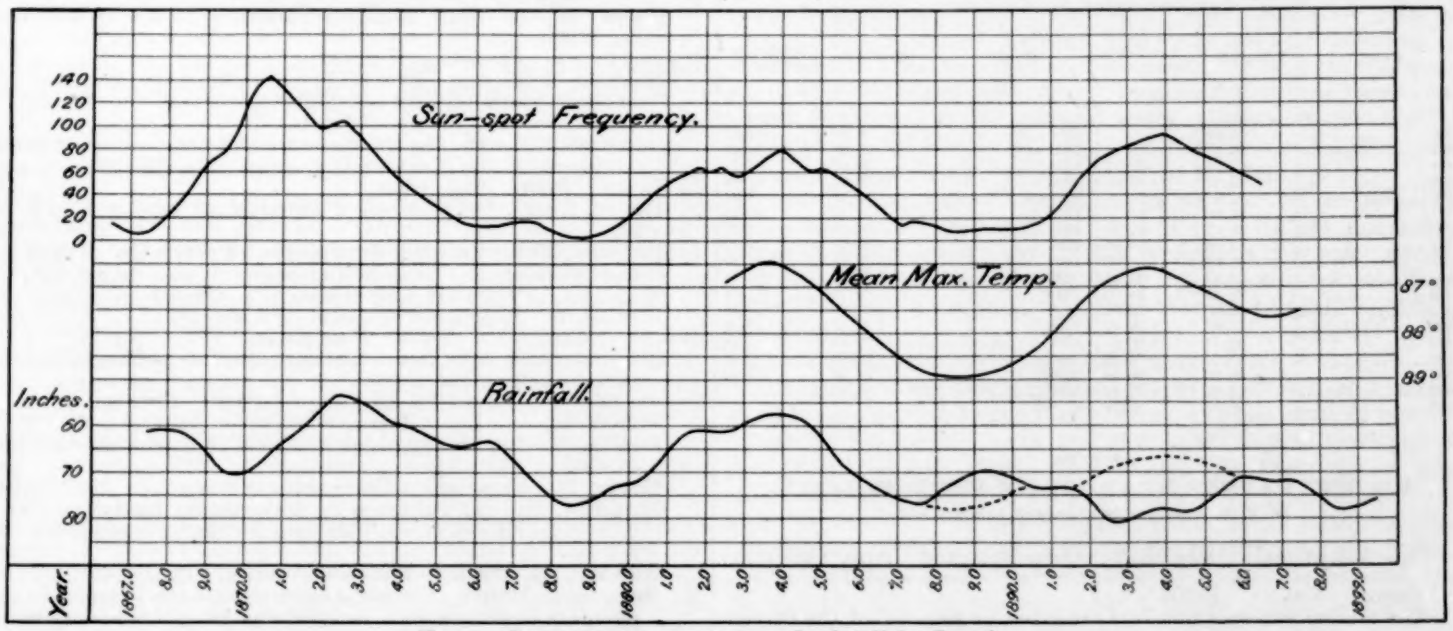

FIG. 1.—Sun spots, temperature, and rainfall for Jamaica.

and 1893 near the times of the sun-spot maxima, and that the highest result occurs in 1889 at the time of the sun-spot minimum.

These effects are reproduced in the twenty-four hour mean temperature column, but without doubt we ought to look to the mean of the daily maxima throughout the year to show any variation in the intensity of solar radiation. This may be done in the same manner that the connection between the sun-spot period and the rainfall in Jamaica [1] was shown, by taking the mean of any three years as the mean of the middle year, and thus reducing the irregularities. Applying this process to the mean maximum temperature we get the following table:

Mean maximum temperatures (smoothed).

	°
1882	86.8
1883	86.5
1884	86.7
1885	87.4
1886	88.1
1887	88.7
1888	88.9
1889	88.8
1890	88.3
1891	87.4
1892	86.9
1893	86.6
1894	86.9
1895	87.3
1896	87.7
1897	87.5

It seems advisable to give in fig. 1 the three curves for sun-spot frequency and mean maximum temperature and rainfall in Jamaica, the two latter curves being smoothed by taking the mean of the results for any three years as the mean result for the middle year.

In the rainfall curve irregularities will be noticed, as shown by the dotted curves. From the middle of 1887 to the middle of 1890 the rainfall was less than it should have been. From the middle of 1891 to the end of 1895 it was greater than it should have been.

Attention is strongly called to these irregularities, because in 1892 it was assumed that the curve would recover its position, and in consequence a smaller rainfall for the next few years was predicted; but 1893 proved unusually wet, producing the smoothed maximum for the middle of 1892.

The following table gives the rainfall in Jamaica as deduced from about ninety stations: [2]

Annual rainfall for Jamaica.

Year.	Rainfall.	Average for 3 years.	Year.	Rainfall.	Average for 3 years.
	Inches.	*Inches.*		*Inches.*	*Inches.*
1866	53.65	.....	1884	56.90	58.67
1867	64.47	61.95	1885	59.86	69.12
1868	67.74	62.53	1886	90.61	73.71
1869	55.37	70.85	1887	70.66	77.79
1870	89.43	64.96	1888	72.11	72.31
1871	50.09	61.57	1889	74.15	70.23
1872	45.18	52.78	1890	64.42	74.42
1873	63.06	59.06	1891	84.70	74.03
1874	68.94	61.47	1892	72.98	81.39
1875	52.42	64.24	1893	86.49	78.29
1876	71.35	64.06	1894	75.39	77.83
1877	68.40	72.06	1895	71.62	71.87
1878	76.42	77.89	1896	68.61	72.61
1879	88.84	73.57	1897	77.59	73.35
1880	55.44	70.96	1898	73.84	79.08
1881	68.60	60.64	1899	85.82	76.44
1882	57.87	61.91	1900	69.65	.....
1883	59.26	58.01			

RECENT PAPERS BEARING ON METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau:

Pearson's Magazine. London. Vol. 12.
Lyle, Eugene P. Shooting away Hailstorms. Pp. 651–660.

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Campbell, W. W. The Lick Observatory; Crocker Eclipse Expedition to Sumatra. P. 331.
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La Nature. Paris. 29me Année.
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Parville, Henri de. Les deux soleils. Pp. 419–420.
Cœurdevache, P. Électricité atmosphérique. Pp. 427–428.
M., P. de. Pyromètre à air bristol. Pp. 428–429.
Deniza, N. Concours d'aviation. Pp. 431–432.

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[2] The tabular sun-spot numbers are given on page 506 of the current REVIEW.

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Kostersitz, K. Zur Frage der Errichtung eines astrophysikalisch-meteorologischen Höhenobservatoriums im Semmeringgebiete. Pp. 487–497.

Ernst, J. W. Graphische Wetterbeschreibung. Pp. 497–504.

Draenert, F. M. Das Klima im Thale des Amazonas-Stromes. Pp. 504–515.

Mohn, H. Absolute Maximum-Temperaturen in Norwegen. Pp. 515–518.

Trabert, W. Die Extinktion des Lichtes in einem trüben Medium (Sehweite in Wolken). Pp. 518–524.

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Woeikof, A. Der Juni 1901 in Südostrussland. Pp. 539–540.

Gerlich, K. Schlauchförmige Wolken. P. 540.

Pocchettino, —. Ergebnisse einiger Messungen der Elektricitätszerstreuung in freier Luft. Pp. 540–542.

—— Ueber die Störungen des normalen atmosphärischen Potentialgefälles durch Bodenerhebungen. Pp. 542–543.

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—— Der Wetterdienst der Landwirthschaftsschule zu Weilburg im Sommer 1901. Pp. 262–264.

NOTES BY THE EDITOR.

RELATIVE FREQUENCY OF SUN SPOTS.

We publish herewith the complete table of the so-called relative sun-spot numbers as prepared originally by Professor Wolf, Director of the Observatory at Zurich, and revised by his successor, Prof. A. Wolfer. Professor Wolf chose the mean solar day as the unit of time, and noted day by day both the number of visible groups of spots and also the number of spots contained in each group. A combination of these two numbers gave him his relative numbers, expressing the sun-spot activity for that particular day. He considered that the formation of a new group of spots was more important than the appearance of a new spot in an already existing group, and was led to compute his relative numbers by the formula, $r = 10\,g + f$, where g is the number of groups visible on any day, and f the total number of spots, whether they were in the groups or isolated. That is to say, if there were eight spots so arranged as to constitute five groups the relative numbers for the day would be 58. The average of the relative numbers for each day gave the mean monthly numbers, and the average of the twelve months gave the mean annual numbers; and these are the numbers given in the accompanying tables.

A different method of computing sun-spot numbers was adopted by Schwabe, who was the original discoverer of the periodic frequency of sun spots. The computations of Wolf have extended back to the earliest observations, whereas Schwabe's discovery was based on his own observations, which began in the year 1826. Schwabe adopted a general period of ten years, but Wolf has shown that the period is exactly 11.111 years.

The relative numbers of Wolf do not always seem to give an exact expression of the sun-spot activity, since they take no account of the size of the spot, and some have proposed to introduce this feature into the calculation. But a careful comparison of Wolf's numbers with the record of spotted areas has shown that they are in general quite nearly proportional to each other. Of course, all that we want is the relative condition from month to month and year to year.

In order to make these numbers as reliable as possible, Wolf combined together the records of different observers, using very different instruments, and each of these records was first reduced by him to something like what would have been given by a normal observer—that is, himself—using a standard instrument, namely, his 4-foot Fraunhofer refractor, whose aperature was 3 inches, and magnifying power 64.

His series of satisfactory numbers based on actual observations begins with the year 1749. Observations were, of course, on record for earlier years, but not in sufficient numbers to justify introduction into this table. In fact, many gaps exist after 1749, and can only be filled in by graphic methods of interpolation. In his original table, Wolf distinguishes two degrees of reliability, namely, the heavy print, representing satisfactory and complete sets of observations, and the starred (*) figures, representing a rather small number of observations eked out by means of interpolations.

The figures that he publishes in italics are simply the maxima and minima, which are italicized in order to attract attention.

Fuller details relative to this subject may be found in the Handbook of Astronomy by Wolf; the article by A Wolfer in the Met. Zeit., 1892; the Bibliothéque universelle de Genéve, Archives des sciences physiques et naturelle, 1891, Vol. XXVI, No. 12, and especially in the annual publication known as the Astronomische Mittheilungen, which was begun by Dr. R. Wolf, and is now continued by A. Wolfer regularly in the Vierteljahrsschrift of the Scientific Society of Zurich.

Those who compare sun-spot numbers with meteorological phenomena should always bear in mind that the spots themselves are not likely to be the cause of changes on the earth, but are rather the result of some process in the sun that affects the earth directly.—*C. A.*

Relative frequencies of sun spots.

[From Klein's Jahrbuch der Astronomie u. Geophysik III. 1892-1900 and Wolfer's Astr. Mitt. 1901.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Mean.
1749	58.0	62.6	70.0	55.7	85 0	83.5	94.8	66.3	75.9	73.5	158.6	85.2	80.9
1750	73.3	75.9	89.2	88.3	90.0	100.0	85.4	103.0	91.2	65,7	63.3	75.4	83.4
1751	70.0	43.5	45.3	56.4	60.7	50.7	66.3	59.8	23.5	23.2	28.5	44.0	47.7
1752	35 0	50.0	71.0	59.3	59.7	39.6	78.4	29.3	27.1	46.6	37.6	40.0	47.8
1753	41.0	32.0	45.7	38.0	36.0	31.7	22.0	39.0	28.0	25.0	20.0	6.7	30 7
1754	0.0	3.0	1.7	13 7	20.7	25.7	18.8	12.3	8.2	24.1	13.2	4.2	12.2
1755	10.2	11.2	6.8	6.5	0.0	0.0	8.6	3.2	17.8	23.7	6.8	20.0	9.6
1756	12.5	7.1	5.4	9.4	12.5	12.9	3.6	6.4	11.8	14.3	17.0	9.4	10.2
1757	14.1	21.2	26.2	30.0	38.1	12.8	25.0	51.3	39.7	32.5	64.7	33.5	32.4
1758	37.6	52.0	49.0	72.3	46.4	45.0	44.0	38.7	62.5	37.7	43.0	43.0	47.6
1759	48.3	44.0	46.8	47.0	49.0	50.0	51.0	71.3	77.2	59.7	46.3	57.0	54.0
1760	67.3	59.5	74.7	58.3	72.0	48.3	66.0	75.6	61.3	50.6	59.7	61.0	62.9
1761	70.0	91.0	80.7	71.7	107.2	99.3	94.1	91.1	100.7	88.7	89.7	46.0	85.8
1762	43.8	72.8	45.7	60.2	39.9	77.1	33.8	67.7	68.5	69.3	77.8	77.2	61.1
1763	36.5	31.9	34.2	32.9	32.7	35.8	54.2	26.5	68.1	46.3	60.9	61.4	45.1
1764	59.7	59.7	40.2	34.4	44.3	30.0	39.0	30.0	28.2	28.0	26.0	25.7	36.3
1765	24.0	26.0	25.0	22.0	20.2	20.0	27.0	29.7	16.0	14.0	14 0	13.0	20.9
1766	12.0	11.0	36.6	6.0	26.8	3.0	3.3	4.0	4.3	5.0	5.7	19.2	11.4
1767	27.4	30.0	43.0	32.9	29.8	33.3	21.9	40.8	42.7	44.1	54.7	53.3	37.8
1768	53.5	66.1	46.3	42.7	77.7	77.4	52.6	66.8	74.8	77.8	90.6	111.8	69.8
1769	73.9	64.2	64.3	96.7	78.6	94 4	118.6	130.3	148.8	158.2	148.1	112.0	106.1
1770	104.0	142.5	80.0	51.0	70.1	83.3	109.8	126.3	104.4	103.6	132.2	102.8	100.8
1771	36.0	46.2	46.7	64.9	132.7	119.5	67.7	58.5	101.4	90.0	99.7	95.7	81.6
1772	100.9	90.8	31.1	92.2	38.0	57.0	77.3	56.2	50.5	78.6	61.3	64.0	66.5
1773	54.6	29.0	51.2	32.9	41.1	28.4	27.7	12.7	29.3	26.3	40.9	43.2	34.8
1774	46.8	65.4	55.7	43.8	51.3	28.5	17.5	6.6	7.9	14.0	17.7	12.2	30.6
1775	4.4	0.0	11.6	11.2	3.9	12.3	1.0	7.9	3.2	5.6	15.1	7.9	7.0
1776	21.7	11.6	6.3	21.8	11.2	19.0	1.6	24.2	16.0	30.0	35.0	40.0	19.8
1777	45.0	36.5	39.0	95.0	80.3	80.7	95.0	112.0	116.2	106.5	146.0	157.3	92.0
1778	177.8	109.3	134.0	245.0	238.9	171.6	153.0	140.0	171.7	156.3	150.3	105.0	154.4
1779	114.7	165.7	118.0	145.0	140.0	113.7	143.0	112.0	111.0	124.0	114.0	110.0	125.9
1780	70.0	98.0	98.0	95.0	107.2	88.0	86.0	86.0	93.7	77.0	60.0	58.7	84.8
1781	98.7	74.7	53.0	68.3	104.7	97.7	73.5	66.0	51.0	27.3	67.0	35.2	68.1
1782	54.0	37.5	37.0	41.0	54.3	38.0	37.0	44.0	34.0	23.2	31.5	30.0	38.5
1783	28.0	38.7	26.7	28.3	23.0	25.2	32.2	20.0	18.0	8.0	15.0	10.5	22.8
1784	13.0	8.0	11.0	10.0	6.0	9.0	6.0	10.0	10.0	8.0	17.0	14.0	10.2
1785	6.5	8.0	9 0	15.7	20.7	26.3	36 3	20.0	32.0	47.2	40.2	27.3	24.1
1786	37.2	47.6	47.7	85.4	92.3	59.0	85.0	89.7	111.5	112.3	116.0	112.7	82.9
1787	134.7	106.0	87.4	127.2	134.8	99.2	128.0	137.2	157.3	157.0	141.5	174.0	132.0
1788	138.0	129.2	143.3	108.5	113.0	154.2	141.5	136.0	141.0	142.0	94.7	129.5	130.9
1789	114.0	125.3	120.0	123.3	123.5	120.0	117.0	103 0	112.0	89.7	134.0	135.5	118.1
1790	103.0	127.5	96.3	94.0	93.0	91.0	69.3	87.0	77.3	84.3	82.0	74.0	89.9
1791	72.7	62.0	74.0	77.2	73.7	64.2	71.0	43.0	66.5	61.7	67 0	66.0	66.6
1792	58.0	64.0	63.0	75.7	62.0	61.0	45.8	60.0	59.0	59.0	57.0	56.0	60.0
1793	56.0	55.0	55.5	53.0	53.3	51.0	50.0	29.3	24.0	47.0	44.0	45.7	46.9
1794	45.0	44.0	38.0	28 4	35.7	41.5	41.0	40.0	11.1	28.5	67.4	51.4	41.0
1795	21.4	39.9	12.6	18.6	31.0	17.1	12.9	25.7	13.5	19.5	25.0	18.0	21.3
1796	22.0	23.8	15.7	31.7	21.0	6.7	26.9	1.5	18.4	11.0	8.4	5.1	16.0
1797	14.4	4.2	4.0	4.0	7.3	11.1	4.3	6.0	5.7	6.9	5.8	3.0	6.4
1798	2.0	4.0	12.4	1.1	0.0	0.0	0.0	3.0	2.4	1.5	12.5	9.9	4.1
1799	1.6	12.6	21.7	8.4	8.2	10.6	2.1	0.0	0.0	4.6	2.7	8.6	6.8
1800	6.9	9.3	13.9	10.2	5.0	23.7	21.0	19.5	11.5	12.3	10.5	40.1	15.3
1801	27.0	29.0	30.0	31.0	32.0	31.2	35.0	38.7	33.5	32.6	39.8	48.2	34.0
1802	47.8	47.0	40.8	50.0	53.0	55.0	57.0	58.0	65.2	56.5	65.5	64.0	55.0
1803	66.0	67.0	68.0	69.0	71.0	72.0	73.0	64.0	75.0	76.0	77.0	77.0	71.2
1804	7.0	75.0	77.0	77.0	77.0	76.0	74.0	72.0	71.0	71.2	67.0	68.0	73.1
1805	61.0	39.0	55.0	46.3	39.0	49.0	47.0	46.0	44.0	43.0	41.0	40.0	47.6
1806	39.0	29.6	28.0	34.0	26.4	25.6	31.0	29.0	28.0	27.0	25.0	24.0	28.9
1807	12.0	12.2	9.6	18.3	10.0	10.2	12.7	12.0	5.7	8.0	2.6	0.0	9.4
1808	0.0	4.5	0.0	12.3	8.6	12.0	6.7	8.0	11.7	4.7	11.3	12.3	7.7
1809	7.2	9.2	0.9	2.5	2.0	7.7	0.3	0.2	0.4	0.0	0.0	0.0	2.5
1810	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1811	0.0	0.0	0.0	0.0	0.0	0.0	6.6	0.0	2.4	6.1	0.8	1.1	1.4
1812	13.4	1.9	0.7	0.0	1.0	1.3	0.5	18.7	5.2	5.5	7.9	10.1	5.5
1813	0.0	10.3	1.9	16.6	5.5	10.7	15.7	8.4	18.2	30.5	16.7	19.6	12.8
1814	22.2	12.0	5.7	23.1	5.8	14.9	18.5	2.3	11.9	21.5	14.5	20.1	14.4
1815	19.2	32.2	26.2	31.6	9.8	55.9	35.3	47.2	31.5	33.5	37.2	65.0	35.4
1816	26.3	68.8	73.7	58.8	44.3	43.6	38.8	28.1	49.3	56.4	38.2	30.6	46.4
1817	36.5	55.2	107.0	25.9	19.2	39.9	47.4	45.4	35.8	25.2	36.5	23.9	41.5
1818	35.1	18.9	22.1	35.7	53.1	36.1	28.1	30.9	27.4	33.2	13.3	25.8	30.0
1819	34.4	20.7	3.7	20.2	18.4	35.7	33.9	25.8	14.9	27.6	25.1	30.6	24.2
1820	13.0	26.6	3.6	18.5	29.3	10.8	22.8	26.3	5.2	8.7	7.9	8.2	15.0
1821	21.5	2.4	5.7	6.0	1.2	1.8	2.5	4.8	4.4	18.3	4.4	0.0	6.1
1822	0.0	0.9	16.1	13.3	1.5	5.6	7.9	2.1	0.0	0.4	0.0	0.0	4.0
1823	0.0	0.0	0.6	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	20.4	1.8

Relative frequencies of sun spots—Continued.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Mean.
1824	21.6	10.8	0.0	20.0	2.8	0.0	0.0	1.4	20.5	25.2	0.0	0.8	8.0
1825	5.0	16.1	14.9	0.4	15.0	15.4	30.9	25.4	16.3	14.4	11.5	22.5	15.6
1826	17.7	18.2	38.2	23.7	32.4	37.1	52.5	39.6	18.9	51.0	38.3	64.5	36.0
1827	34.3	46.0	56.0	46.0	55.5	56.7	42.9	53.7	49.6	57.2	48.2	46.1	49.4
1828	52.8	64.4	65.0	61.1	89.1	98.0	54.3	76.4	50.4	34.7	57.0	46.9	62.5
1829	43.0	49.4	72.3	97.6	67.5	75.5	90.8	77.4	50.3	60.6	66.7	56.5	67.3
1830	49.9	70.9	84.6	107.1	66.3	65.1	43.9	50.7	62.1	84.4	81.2	82.1	70.7
1831	47.5	50.1	93.4	54.6	38.1	33.4	45.2	54.9	37.9	46.2	43.5	28.9	47.8
1832	30.9	55.5	55.1	26.9	41.3	26.7	13.9	8.9	8.2	21.1	14.3	27.5	27.5
1833	11.3	14.9	11.8	2.8	12.9	1.0	7.0	5.7	11.6	7.5	5.9	9.9	8.5
1834	4.9	18.1	3.9	1.4	8.8	7.8	8.7	4.0	11.5	21.8	30.5	34.5	13.2
1835	7.5	24.5	19.7	61.5	43.6	33.2	59.8	59.0	100.8	95.2	100.0	77.5	56.9
1836	88.6	107.6	98.1	142.9	111.4	124.7	116.7	107.8	93.1	137.4	120.9	206.2	121.8
1837	188.0	175.6	134.6	138.2	111.3	158.0	162.8	134.0	96.3	123.7	107.0	129.8	138.2
1838	144.9	84.8	140.8	126.6	137.6	94.5	108.2	78.8	78.6	90.8	77.4	79.8	103.1
1839	107.6	102.5	77.7	61.8	53.8	54.6	84.7	131.2	132.7	90.8	68.8	63.6	85.8
1840	81.2	87.7	55.5	65.9	69.2	48.5	60.7	57.8	74.0	49.8	54.3	53.7	63 2
1841	24.0	29.9	29.7	42.6	67.4	55.7	30.8	39.3	35.1	28.5	19.8	38.8	36.8
1842	20.4	22.1	21.7	26.9	24.9	20.5	12.6	26.5	18.5	38.1	40.5	17.6	24.2
1843	13.3	3.5	8.3	8.3	21.1	10.5	9.5	11.8	4.2	5.3	19.1	12.7	10.7
1844	9.4	14.7	13.6	20.8	12.0	3.7	21.2	23.9	6.9	21.5	10.7	21.6	15.0
1845	25.7	43.6	43.3	56.9	47.8	31.1	30 6	32.3	29.6	40.7	39.4	59.7	40.1
1846	38.7	51.0	63.9	69.2	59.0	65.1	46.5	54.8	107.1	55.9	60.4	65.5	61.5
1847	62.6	44.9	85.7	44.7	75.4	85.3	52.2	140.6	161.2	180.4	138.9	109.6	98.4
1848	150.1	111.8	108.9	107.1	102.2	123.8	139.2	132.5	100.3	132.4	114.6	159.9	124.3
1849	156.7	131.1	96.5	102.5	80.6	81.2	78.0	61.3	93.7	71.5	99.7	97.0	95.9
1850	78.0	89.4	82.6	44.1	61.6	70.0	39.1	61.6	86.2	71.0	54.8	60.0	66.5
1851	75.5	105.4	64.6	56.5	62.6	63.2	36.1	57.4	67.9	62.5	50.9	71.4	64.5
1852	68.4	67.5	61.2	65.4	54.9	46.9	42.0	37.9	37.5	67.3	54.3	45.4	54.2
1853	41.1	42.9	37.7	47.6	34.7	40.0	45.9	50.9	33.5	42.3	28.8	23.4	39.0
1854	15.4	20.0	20.7	26.4	24.0	21.1	18.7	15.5	22.4	12.7	28.2	21.4	20.6
1855	12 3	11.4	17.4	4.4	9.1	5.3	0.4	3.1	0.0	9.7	4.2	3.1	6.7
1856	0.5	4.9	0.4	6.5	0.0	5.0	4.6	5.9	4.4	4.5	7.7	7.2	4.3
1857	13.7	7.4	5.2	11.1	29.2	16 0	22.2	16.9	42.4	40.6	31.4	37.2	22.8
1858	39.0	34 9	57.5	38.3	41.4	44.5	56.7	55.3	80.1	91.2	51.9	66.9	54.8
1859	83.7	87.6	90.3	85.7	91.0	87.1	95.2	106.8	105.8	114.6	97.2	81.0	93.8
1860	81 5	88.0	98.7	71.4	107.1	108.6	116.7	100.3	92.2	90.1	97.9	95.6	95.7
1861	62.3	77.8	101.0	98.5	56.8	87.8	78.0	82.5	79.9	67.2	53.7	80.5	77.2
1862	63.1	64.5	43.6	53.7	64.4	84.0	73.4	62.5	96.6	42.0	50.6	40.9	59.1
1863	48.3	56.7	66.4	40.6	53.8	40.8	32.7	48.1	22.0	39.9	37.7	41.2	44.0
1864	57.7	47.1	66.3	35 8	40.6	57.8	54.7	54.8	28.5	33.9	57.6	28.6	46.9
1865	48.7	39.3	39 5	29.4	34.5	33 6	26.8	37.8	21.6	17.1	24.6	12.8	30.5
1866	31.6	38.4	24.6	17.6	12.9	16.5	9.3	12.7	7.3	14.1	9.0	1.5	16.3
1867	0.0	0.7	9.2	5.1	2.9	1.5	5.0	4.9	9.8	13.5	9.3	25.2	7.3
1868	15.6	15.8	26.5	36.6	26 7	31.1	28.6	34.4	43.8	61.7	59.1	67.6	37.3
1869	60.9	59.3	52.7	41.0	104.0	108.4	59.2	79.6	80.6	59.4	77.4	104.3	73.9
1870	77.3	114.9	159.4	160.0	176.0	135.6	132.4	153.8	136.0	146.4	147.5	130.0	139.1
1871	88.3	125 3	143.2	162.4	145.5	91.7	103.0	110.0	80 3	89.0	105.4	90.3	111.2
1872	79.5	120.1	88.4	102 1	107.6	109.9	105.2	92.9	114.6	103.5	112.0	83.9	101.7
1873	86.7	107.0	98.3	76.2	47.9	44.8	66.9	68.2	47.5	47.4	55 4	49.2	66.3
1874	60.8	64 2	46.4	32.0	44.6	38.2	67.8	61.3	28.0	34.3	28.9	29.3	44 6
1875	14 6	22 2	33.8	29.1	11.5	23.9	12.5	14.6	2 4	12.7	17.7	9.9	17.1
1876	14.3	15.0	31.2	2.3	5.1	1.6	15.2	8.8	9.9	14.3	9.9	8.2	11.3
1877	24.4	8.7	11.7	15.8	21.2	13.4	5.9	6.3	16.4	6.7	14.5	2.3	12.3
1878	3.3	6.0	7.8	0.1	5.8	6.4	0.1	0.0	5.3	1.1	4.1	0.5	3.4
1879	0.8	0.6	0.0	6.2	2.4	4.8	7.5	10.7	6.1	12.3	12.9	7.2	6.0
1880	24.0	27.5	19.5	19.3	23.5	34.1	21.9	48.1	66.0	43.0	30.7	29.6	32.3
1881	36.4	53.2	51.5	51.7	43.5	60.5	76.9	58.0	53.2	64.0	54.8	47.3	54.3
1882	45.0	69.3	67.5	95.8	64.1	45.2	45.4	40.4	57.7	59.2	84.4	41.8	59.6
1883	60.6	46 9	42.8	82.1	32.1	76.5	80.6	46.0	52.6	83.8	84.5	75.9	63.7
1884	91.5	86.9	86.8	76.1	66.5	51.2	53.1	55.8	61.9	47.8	36.6	47.2	63.5
1885	42.8	71.8	49.8	55.0	73.0	83.7	66.5	50.0	39.6	38.7	33.3	21.7	52.2
1886	29.9	25.9	57.3	43.7	30.7	27.1	30.3	16.9	21.4	8.6	0 3	12.4	25.4
1887	10.3	13.2	4.2	6.9	20.0	15.7	24.3	21.4	7.4	6.6	6.9	20.7	13.1
1888	12.7	7.1	7.8	5 1	7 0	7.1	3.1	2.8	8.8	2.1	10.7	6.7	6.8
1889	0 8	8.5	7 0	4.3	2.4	6.4	9.7	20.6	6.5	2.1	0.2	6.7	6.3
1890	5.3	0.6	5.1	1.6	4.8	1.3	11.6	8.5	17.2	11.2	9.6	7.8	7.1
1891	17.1	23.0	10.0	19.4	43.2	48.7	59.1	32.6	52.1	50.4	41.0	30.6	35.6
1892	72.4	72.4	52.5	69.6	79.2	76.6	77.9	102.6	62.2	74.8	67.1	77.8	73.8
1893	75.0	74.0	65.7	88.1	84.7	88.2	88.8	129.2	77 9	79.7	75.1	98.8	84.9
1894	83 2	84.6	52.3	81.6	101.2	98.9	106.0	70.3	65.9	75.5	53.6	60.0	78 0
1895	63.3	67.2	61.0	76.9	67.5	71.5	47.8	68.9	57.7	67.9	47.2	70.7	64.0
1896	29.0	57.4	52.0	43.8	27.7	49.0	45.0	27.2	61.3	28.4	38.0	42 6	41.8
1897	40.6	29.4	29.1	31.0	20.0	11.3	27.6	21.8	48.1	14.3	8.4	33.3	26.2
1898	30.2	36.4	38.3	14.5	25.8	22.3	9.0	31.4	34.8	34.4	30.0	12.6	26.7
1899	19.5	9.2	18.1	14.2	7.7	20.5	13.5	2.9	8.4	13.0	7.8	10.5	12.1
1900	9.4	13.6	8.6	16.0	15.2	12.1	8.3	4.3	8.3	12.9	4.5	0.3	9.5

HAILSTORM ON THE ST. LAWRENCE.

The following account of a hailstorm in northern New York is sent us by Mr. H. S. Chandler, of Crawford, N. J. It is of special interest because of the variety of forms and the great size of the stones. Fortunately storms of this character are rare in the United States:

At 2:30 p. m., August 8, 1901, I was sitting on my piazza on Florence Island, St. Lawrence River, opposite the village of Alexandria Bay, N. Y., and saw a storm gathering about 6 miles down the river. It came nearer, accompanied by thunder and lightning, and reached us about 3 o'clock. The temperature at that time was 72° and the wind about north.

First came a heavy fall of rain, which was followed by hail. The first stones to fall were formed as though icicles the size and shape

of lead pencils had been cut into sections about three-eights of an inch in length. These were soon followed by others as large as walnuts, and later by still others slightly disk shaped, measuring fully 3 inches in diameter by 2 inches in thickness. The ground was covered with them, and several branches of trees were broken off. They were exceedingly hard and would rebound, when falling on the rocks, without breaking. They melted very slowly even when placed in the sun. When half melted many had the appearance of the human eye—a pupil in the center and a ring surrounding it, with fine lines radiating in all directions. Others were composed of hard crystals of ice, several stones often being frozen together; and still others were of frozen snow. The next morning at 8 o'clock remnants of hailstones as large as peas were lying on the ground.

During the storm the river presented a beautiful appearance, there being thousands of miniature fountains from a foot to 6 feet in height [spurting up where the hail plunged in.—C. A.].

At the conclusion of the storm, which altogether lasted ten minutes, the thermometer had fallen to 70°. Probably the same storm was noted by a friend of mine, on the same day, in a railway train north of Saratoga, N. Y., when some of the car windows were broken.

A half hour after the storm was over we gathered a pailful of the hailstones, rowed half a mile across the river, and had them photographed.

PLAGIARISM

The compilers of books and articles frequently have occasion to quote from previous authors. Scrupulous honesty requires that quotation marks should be used in such cases, and thoughtful readers always wish the author's name also, together with the name and date of the publication and the page of the book, so that the quotation may be verified and its context be examined, in order that there may be no doubt as to the author's meaning. The very fact that one author has need of the ideas contained in another authority in order to complete or confirm his own work suffices to show that the reader also will need to know what these authorities are; therefore, the author who values his reputation will be careful to give them in full.

When writing a special class of books, such as those for children, and when making popular addresses to miscellaneous audiences, it is proper to avoid pedantry and give less prominence to the quotations, yet there should always be some way of distinguishing them from the main text. There is no good reason why articles printed in newspapers and popular magazines should not clearly show the quotations and the sources, although this is sometimes omitted.

An abstract of another article when given in new words is not a quotation, but the original author should be named. When only a series of disconnected paragraphs is taken from other works the quotation marks belong at the beginning and ending of the series, and the intervals between the paragraphs are to be filled in with leaders. The fonts of type make provision for every emergency in the matter of quotations. Probably the neatest method is to print quoted matter in smaller type.

The most serious aspect of the omission of quotation marks and references to authorities is the reaction upon the reputation of an author. If he quotes a fine English composition without mentioning the source, it is called plagiarism, literary piracy, borrowing without acknowledgment, theft, stealing, deception, fraud, dressing up in stolen clothes. Not unlikely the pirate brings on himself a suit for damages from some indignant publisher. Almost certainly his own publisher, as soon as the fraud is discovered, cuts off the promised remuneration or honorarium. If his article has been contributed to a journal or periodical the editor informs him that no more communications will be accepted.

Even if an author quotes from an earlier work by himself or introduces into a new article extensive portions of some old one, he should state that he is doing so. No publisher would willingly print as new matter that which had been published and read before. It is only the very cheapest papers and magazines that "will print anything" without asking questions, so as to fill up the columns, omitting notes or acknowledgments and assuming that the readers will not recognize the antiquity of the stuff, or care for the authority behind it.

It was in order to avoid the bad results injurious both to the Weather Bureau and the plagiarist that the Chief directed the publication of Circular Letter No. 11, State Weather Service Division, dated August 23, 1895.—*C. A.*

EARTHQUAKE-PROOF BUILDINGS

Although earthquakes have but little to do with meteorology, yet, the fact that our three thousand observers so frequently make mention of them, demonstrates that the weather service could investigate the frequency and distribution of these visitors if only that were not a question pertaining especially to the province of the United States Geological Survey.

However, there is a practical application of our knowledge of earthquakes that accords entirely with the beneficent spirit that pervades the Weather Bureau, and that is worthy a place in the MONTHLY WEATHER REVIEW.

The studies of Mallet on the great Neapolitan earthquake of 1857[1] demonstrated that by following certain rules, buildings could be erected that should be proof against destruction by any special class of quakes or shocks, and such buildings have already been built in Japan. The modern tall steel frame buildings are almost certainly proof against any but the most violent shocks, such as that of Riobomba in 1797.

The engineer in charge of the completion of the Washington obelisk, Bernard F. Green, assured the Editor that *it* is proof against such earthquakes as those of Boston, 1755, and Charleston, 1887.

The natives of some tropical countries have been accustomed to regard the slight skeleton huts as "earthquake proof," and yet they always rush out into the open air when the shocks come.

The following letter from Mr. James H. Kimball, Observer United States Weather Bureau at the station at Modena, Utah, shows that even a rickety frame house, when supported on elastic posts, may rock to and fro without injury, when a building of brick or stone and mortar would crack or crumble:

The following extract taken from Journal notes of this date (November 13) at Modena, Utah, is forwarded in the hope that it may prove of special interest:

"Two distinct tremors were felt here to-night. The first at 11:33 p.m., seventy-fifth meridian time, and the second, after an interval of about ten seconds.

"The Oregon Short Line Depot, where the Weather Bureau office is located (about 37° 20′ N.; 113° 10′ W., in Iron County), is now undergoing repair and is supported on jacks. The building is, at best, a mere shell and jokes regarding it are common. So when the tremors occurred little attention was paid to them, as the explanation that some one had pushed the building seemed plausible, and readily suggested itself. However, the following observations were secured:

"The first tremor, 11:33 p. m., could be accurately reproduced, in a building of this kind, by striking a sharp, noiseless blow on the northeast side. The vibrations were rapid and had ceased in about two seconds.

"The second shock was unlike the first, except in time of duration. The individual waves were much longer, and the general effect more noticeable; the building swayed slightly, but small furnishings were not displaced. The same motion could be produced by a strong push.

"A decided tremor was felt at Lund, Utah, at 11:32 p. m. This was sufficient to stop the station clock. Lund is about 30 miles northeast of Modena.

"At Milford, 66 miles northeast of Modena, small packages were thrown from the shelves of the general store. No time could be secured.

"Tremors were reported from Paris, 132 miles northeast of Modena at 11:37 p. m."

[1] Robert Mallet, First Principles of Observational Seismology. London, 1862.

The Bureau is indebted to Mr. Robert Morton, Agent in charge of the Oregon Short Line Station at Modena, for his active interest in this matter.

We commend the study of the subject and the study of Mallet's work to those who are planning houses, structures, and other buildings in this country. Our earthquakes are comparatively slight, but still they ought to be considered in every plan for the erection of reliable structures.—*C. A.*

SIGNS AND WEATHER.

The following extract is from the editorial page of the Ithaca, N. Y., Herald for November 15, 1901, under the above heading:

The Weather Bureau has predicted a hard winter, and the present early snowfall would indicate that the prediction is to be fulfilled. But lake sailors recall a winter several years ago when the Bureau predicted severe weather that did not materialize, and they declare that certain signs and omens show that the winter is to be a mild one.

It is not understood how the editor above quoted could have been so completely misled as to the purpose and work of the United States Weather Bureau.

It has never yet attempted to forecast the weather for a season in advance, and does not anticipate doing so in the near future.

Neither is it aware of any other reputable meteorological service that is attempting such forecasts, with the possible exception of the Indian Meteorological Office, which is investigating the relation between the variations in the number of sun spots and the occurrence of droughts in India.

In general, seasonal forecasts have been undertaken by prophets of the Hicks or Wiggins type only, or by would-be scientists who read the weather from the signs of the moon or of the stars. Many farmers have professed to be able to forecast the character of the coming winter from the thickness of the husks on the ears of corn, and hunters make like forecasts based upon the character of the breast bone of the goose, and the early or late southward migration of birds.

We have every reason to expect that forecasts of this character will continue to be made for many years to come, or at least until the public in general has learned to distinguish betweeen science and superstition, facts and fancy.

Meanwhile the Weather Bureau will devote itself to the study of meteorology and the laws governing the generation and propagation of storms. It will endeavor from day to day to forecast the probable course of such storms as make their appearance upon the weather map, and to foretell the weather changes that will occur in different parts of the country as a result of the storm movements. With these daily forecasts we must be content until the science of meteorology is more fully developed.

The intelligent daily press of our land has been of inestimable value in disseminating the forecasts of the Bureau among the people whom they are intended to benefit. The public will be still further its debtor if it will join hands with the Weather Bureau in an effort to eradicate from the popular mind the many fallacies that have no foundation in fact, but are a survival of traditions handed down from some past generation when scientific knowledge was confined to the few.—*H. H. K.*

THE EQUINOCTIAL STORM.

The Salem, Oreg., Statesman, for October 1, 1901, quotes the following from the Philadelphia Press:

As a matter of fact for years all the leading meteorologists in the United States Weather Bureau and out of it, in book, article, lecture, and government publications, have set out clearly and distinctly the non-existence of any such thing as an equinoctial storm. Moreover, they have also explained how, owing to the fact that September is the month of maximum development of the West Indian hurricanes, the belief originated and is from time to time seemingly confirmed by the actual weather facts.

The Statesman then comments upon this paragraph of the Press, as follows:

There has not been a year since Mount Hood first reared its majestic head over its own big empire that has failed to bring a rain storm between the 15th and the 25th of September. * * * This unfailing regularity can be none other than the result of equinoctial disturbances.

Mr. E. A. Beals, Local Forecast Official at Portland, Oreg., has prepared the following tables showing the rainfall each day from September 15 to October 6, inclusive, for the last thirty years—1872 to 1901, inclusive.

Daily rainfall at Portland, Oreg., September 15–25.

Year.	Day of month.										
	15th.	16th.	17th.	18th.	19th.	20th.	21st.	22d.	23d.	24th.	25th.
1872	.....	.....	.....	.....	.....	.....	.....	1.07	0.01	.....	.....
1873	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1874	.....	.....	0.01	.....	.....	.....	.....	.....	.....	0.01	.....
1875	.....	.....	...	.....	0.03	.....	.....	.....	.....	.....	.....
1876	.....	.....	.....	0.18	.....	0.85	0.04	.....	.....	.....	.....
1877	.....	.....	.....	.....	.....	0.18	.....	.....	0.01	.....	1.07
1878	.....	.....	.....	.....	.....	.....	0.05	T.	0.97	0.05	T.
1879	.....	.....	.....	.....	.....	.....	.....	0.01	0.01	.....	.....
1880	.....	.....	0.26	.....	.....	T.	.....	0.26	0.82	T.	.....
1881	.....	.....	0.40	0.70	0.25	.....	0.01	0.37	0.57	0.22	0.07
1882	0.07	.....	0.01	.....	.....	.....	.....	.....	.....	.....	.....
1883	.....	.....	0.02	0.33	.....	.....	.....	.....	.....	.....	.....
1884	.....	.....	.....	.....	.....	T.	0.11	.....	.....	.....	.....
1885	0.32	.....	.....	.....	.....	.....	.....	.....	0.74	0.19	.....
1886	.....	.....	.....	.....	.....	.....	.....	0.36	0.20	0.01	0.17
1887	.....	.....	.....	0.43	0.79	.....	.....	.....	.....	0.01	.....
1888	.....	.....	0.14	0.03	0.84	0.02	.....	.....	.....	.....	.....
1889	.....	.....	.....	.....	.....	T.	T	0.41	0.06	0.01	0.01
1890	.....	.....	.....	.....	T.	.....	.....	.....	.....	.....	.....
1891	.....	0.01	0.05	0.32	0.22	.....	T	0.07	.....	.....	.....
1892	.....	.....	T.	T	T	0.13	.....	0.53	0.70	0.27	.....
1893	.....	.....	T.	0.03	0.58	0.16	0.01	.....	.....	.....	.....
1894	0.02	.....	.....	0.04	.....	.....	T.	.....	.....	.....	0.20
1895	0.01	0.02	.....	.....	0.13	0.03	.....	.....	.....	T.	.....
1896	0.37	.....	.....	.....	.....	.....	.....	.....	T.	.....	.....
1897	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1898	.....	.....	.....	.....	0.35	.....	1.27	0.24	T.	T.	.....
1899	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1900	0.25	0.04	T.	.....	0.42	0.25	T	T.	0.11	.....	.....
1901	.....	.....	.....	.....	.....	T	0.88	0.69	0.25	0.18	0.39

Daily rainfall at Portland, Oreg., September 26 to October 6.

Year.	Day of month.										
	26th.	27th.	28th.	29th.	30th.	1st.	2d.	3d.	4th.	5th.	6th.
1872	0.04	.....	.....	.....	.....	.....	0.22	0.23	0.01	.....	.....
1873	.....	.....	.....	.....	.....	.....	.....	.....	0.01	.....	.....
1874	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1875	.....	.....	.....	.....	.....	.....	0.08	0.36	.....	.....	.....
1876	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1877	0.04	0.51	0.49	0.13	.....	0.95	0.24	0.75	0.50	0.19	0.11
1878	0.04	0.61	0.26	0.60	0.88	0.15	0.01	...	.....	T.	.....
1879	.....	0.19	0.56	0.16	0.80	0.04	0.07	0.09	0.22	0.29	0.39
1880	.....	.....	.....	.....	.....	0.01	.....	.....	.....	.....	.....
1881	.....	.....	T.	.....	0.03	.....	.....	0.26	0.05	T.	0.03
1882	.....	.....	.....	.....	0.02	0.50	0.54	0.10	0.03	0.11	0.50
1883	.....	.....	0.14	0.01	0.02	1.07	.....	.....	0.26	0.35	0.07
1884	.....	T.	0 11	0.69	0.46	0.02	.....	.....	0.16	0.14	0.01
1885	.....	0.06	0.03	.....	.....	.....	.....	.....	.....	.....	.....
1886	.....	.....	.....	.....	.....	.....	.....	.....	0.02	.....	.....
1887	.....	.....	.....	0.04	1.17	0.19	.....	.....	0.10	0.13	0.76
1888	.....	.....	.....	.....	0.10	0.03	.....	.....	.....	.....	.....
1889	...	T.	0.01	0.75	0.26	0.33	.....	0.01	.....	T.	0.01
1890	.....	.....	.....	T.	.....	0.37	0.08	0.05	0.25	0.27	0.04
1891	.....	.....	0.28	0.55	0.07	.....	.....	0.01	.....	.....	.....
1892	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	T.
1893	T.	....	0.10	0.63	.....	.....	0.03	0.17	0.21	0.06	0.73
1894	0.16	0.09	0.08	0.01	0.02	0.30	0.17	0.09	.....	0.02	.....
1895	.....	.....	.....	.....	.....	T.	T.	.....	.....	.....	.....
1896	.....	.....	.....	.....	0.02	0.08	0.03	.....	.....	.....	.....
1897	T.	0.25	T.	0.08	0.03	0 01	.....	.....	.....	.....	.....
1898	.....	0.10	0.02	0.26	0.25	0.26	0 15	.....	T.	....	.....
1899	.....	.....	.....	0.20	0.37	0.24	0.02	.....	.....	.....	T.
1900	.....	.....	.....	.....	T	.....	T.	T.	0.05	0.04	T.
1901	0.16	0.05	0.10	0.44	.....	0.17	0.06	.....	0.03	0.26	.....

A most casual examination of these tables will convince any one that the editor of the Statesman was not conversant with the facts when he penned the above comment. During the last thirty years there have been four years without a measurable amount of rain between the dates he specifies, and in two additional years not over 0.01 inch fell on any one day.

If we except the 15th, there were ten years when not over 0.04 inch of rain fell on any one day.

If we compare this period with the period September 26 to October 6, which latter has but seven years with less than 0.04 inch of rainfall on any one day, we must admit that there is *no* "unfailing regularity" and that the "result of equinoctial disturbances" is *not* apparent.

In other words the annual changes of season are in general owing to the movement of the sun north and south, but do not have any close connection with the date of solstice or equinox.—*H. H. K.*

THE NOVEMBER METEORS.

While meteorology in its broadest sense includes all phenomena occurring in the earth's atmosphere, the study of meteors or shooting stars pertains more particularly to the science of astronomy. No special effort was therefore made by the Weather Bureau to obtain observations of the expected November shower of Leonids, further than that existing instructions require that all meteors observed shall be noted in the daily journal. Very interesting special reports were made, however, by the observers at Phoenix, Ariz., and Havre, Mont., and these, together with the following extracts from daily journals at a few other stations, show to what extent the Leonids were seen by Weather Bureau observers. Doubtless, many more reports would have been received but for the fact that no instructions were issued, and that the principal display appears to have occurred between 5 a. m. and 8 a. m. of the 15th, just previous to the hour when our morning observers go on duty, and about the time day was breaking in the eastern part of the United States.

These reports serve to illustrate the importance of a knowledge of other branches of science besides meteorology, if our observers are to record accurately all that comes under their notice. The present course of study outlined by the Chief of Bureau for candidates for promotion provides for just this kind of general information.

LEONIDS AT PHOENIX, ARIZ.

By D. S. LANDIS, Observer, Weather Bureau, dated Novea ber, 20, 1901.

The Leonids observed at Phoenix, Ariz., showed to a fine advantage on the morning of the 15th, owing to a perfectly clear sky. The greatest display occurred about 5 a. m., local time. The showers were not constant, but came at intervals of about two minutes. A bevy would streak the sky for a few seconds, then the number would dwindle away to a straggling few here and there until another shower would come on. Within ten minutes four profuse and distinct showers were noted.

Twenty Leonids were counted within one minute flying over a space checked off by a house top. The angle of descent seemed to be about forty degrees from the perpendicular. The path of translation was due northwest, except in cases where violent explosion was apparent, causing deflection. In one instance an explosion was noticed wherein the main part of the Leonid was deflected to the southwest, and two zig zag lances of yellow flame darted off to the northeast.

The prevailing color was white. Some were tinged with yellow, a few were bluish, and others had tintings of red, both on the head and the edges of the wake of light. Most of the bodies showed a brilliant white center with purplish borders. One very large one resembled a six-inch globe of cankerous fire with spicules of red and yellow radiating from all points on the surface.

The path of light behind each body spread out into a feathery fan shape, and explosions were evident in the train of light, for the larger points would fly violently into a powdery haze, scintillate in a sort of luminous effervescence, and go out.

The first appearance of a Leonid coming toward you from the southeast showed a reddish point of light which quickly merged into a yellow hue, mixed with blue, then flared into an incandescent splendor. As the Leonid approached, the point increased rapidly in size, sometimes to apparently six inches in diameter, then tapered down to powdery sparks which invariably showed a violet caste before disappearing.

The sizes varied from mere beads of flaring white, with thin iris colored threads behind, to globes half a foot in diameter, with explosive trains of variegated lights hundreds of yards in length.

The life of some of the larger Leonids was fully five seconds from the time of the first point of light to the fading away of the luminous dust into darkness.

It would have been impossible to have counted the number, for they rained down from all points of the heavens at intervals of about two minutes apart, and the descent continued until the morning light obscured them.

LEONIDS AT HAVRE, MONT.

By C. W LING, Observer Weather Bureau, dated November 15, 1901.

A beautiful display of Leonids or shooting stars was observed at this station this morning. When I stepped out of the door at 7:30 a. m. (seventy-fifth meridian time). I looked up at the constellation Leo and saw four meteors in less than that many seconds. After I had filed my morning report I met the night policeman, who was waiting to tell me about the unusual number of shooting stars he had seen during the preceding hour. I explained to him what they were and showed him the point from which they radiated. We then watched these meteors for over half an hour and saw at least a hundred of them. Some were of great brilliancy, and some were actually seen to radiate directly from the constellation Leo, and all seemed to emerge from within the sickle in that constellation. At intervals they came into the earth's atmosphere at the rate of one a second for at least six seconds. As long as a star could be seen in this constellation these shooting stars appeared and continued until the great circle of illumination shut off all further view of them.

Abstracts from Daily Journals of November 15, 1901.

(*a*) Forth Worth, Tex., John Shultz, Observer: Although frequent observations were made during the night only a few meteors were seen before 5:10 a. m. From that time until 5:20, 76 were counted; from 5:20 to 5:50, 60; and from 5:50 to 6:30 only 6 were observed. They appeared at irregular intervals, and as there were frequently from 5 to 10 or more visible at a time, it is probable that a great many were not counted. Many of them were remarkably brilliant and beautifully colored. With few exceptions, they all came from a portion of the sky embraced within a circle of about 15° in diameter, and the center of which was about 4° above the star Regulus. The short paths of the meteors was a notable feature of the display; only a few appeared to go overhead toward the west-northwest, the remainder descending in nearly vertical paths, deflected slightly toward the north or south. All of them showed evidence of rapid disintegration; the brightest ones left continuous trails, with numerous fragments thrown off laterally, but the trails of the fainter ones had a broken or chain-like appearance.

(*b*) Independence, Cal , John McLean, Observer: Meteoric shower reported in the northern heavens by Mr. Anton immediately after the observer came down from roof platform at about 7:47 a. m. About twenty-five meteors were seen moving in different directions.

(*c*) Amarillo, Tex., James F. Atherton, Observer: Moderate shower of Leonids observed at early dawn.

(*d*) Cairo, Ill., Patrick H. Smyth, Observer: Meteor observed at 7.09 a. m. First seen at an altitude of about 30°, azimuth about 335°; course easterly or nearly so. Meteor appeared about the size of the morning star, the only star visible at the time.—*H. H. K.*

ICE CAVES AND FREEZING WELLS.

In the National Geographic Magazine for December, 1901, Vol. XII, p. 433, Mr. W J McGee writes as follows on the above subject:

It is greatly to be regretted that recent writers on ice caves and frozen wells have not extended observation to the "blowing caves," "breathing wells," and "whistling wells" found in various parts of this and other countries, and sporadically recorded in ephmeral literature; for the physical laws exemplified in these are alike, and presumptively connected with those revealed in glacières and ice wells.

* * * * * * *

Now it is evident that when the barometer is high in a region of caves or breathing wells, the subterranean chambers or pervious beds will gradually fill with the slightly compressed air, and that the process of filling will be accompanied by inspiration, or in-blowing through the open mouth; it is equally evident that with the subsequent fall of the barometer the imprisoned air will expand and force itself outward through the mouth of the cavern until the pressure within and without is brought into balance. Furthermore it is evident that the air expanding in the throat of the orifice will abstract heat from surrounding substances, precisely as it does in the expansion chamber of an atmospheric ice machine, at a rate and to an amount varying with the

pressure difference; and hence that (provided other conditions be favorable) the moisture on adjacent surfaces may be congealed. In short, under favorable circumstances, the breathing well or blowing cave may become a natural ice machine, clumsy and inefficient, indeed, yet possibly making up in magnitude for its simplicity and the slightness of the pressure differences within its reach. Of course it would seem at first sight that in each passage from low pressure to high and back again, as in the long run, the effects of the natural mechanism would balance, i. e., that the heat given off in inspiration would equal the chill of expiration, so that no refrigeration could ensue; yet when the seasonal ranges of barometer and thermometer are considered, it would seem clear that the heating would tend to culminate in autumn and the chill in spring, in such wise as to sustain the widespread popular opinion on the subject, i. e., that the period of ice melting runs into winter and that of ice forming into late spring and summer.

This is evidently an interesting subject for investigation on the part of the numerous voluntary observers of the Weather Bureau. As Mr. McGee points out, there is a lack of definite information in regard to many features of ice caves. From the fact that ice is occasionally found in July where it is not found in January, the erroneous conclusion has sometimes been reached that there are caves in which ice forms during the summer and melts during the winter. It also appears that measurements of currents flowing into or out of caves are very much to be desired. My own observations[1] indicate that there can be only a slight movement of the air into or out of an ice cave during the summer. A rapid circulation of the air would soon melt the ice, and it is because a circulation can not be maintained that the ice is preserved.

Observations of the temperature of the air in ice caves each month, or, better still, each week, together with measurements to determine whether the ice deposit is increasing or diminishing, would throw much light on the process of ice formation. At the same time it would be a simpler matter to ascertain by means of a light thread held in the hand, or even by observing the movement of the fog from the breath, whether there is any perceptible flow of air into or out of the cave. This latter observation should be made in the passageway leading to the bottom of the cave, where the ice usually forms, as well as near the ice itself. There is danger of mistaking the movement of the air past the mouth of the cave for a movement out of it, and observations at this point should therefore be taken with great caution.

It would also be interesting to notice whether there is any marked increase in the circulation of the air in caves in winter over that in summer.

Already two of our voluntary observers have sent us communications on the subject of ice caves. Mr. A. D. Elmer, Northfield, Mass., writes that there is a cave in the Northfield Mountains in which ice is often found as late as August. He also refers to a very cold stream of water of considerable size in Hilsdale, N. H., over which a thin fog hangs in summer. We should very much like data in regard to the temperature of this stream, and also with respect to the prevalence of fog upon it at different seasons of the year.

Mr. Galloway C. Morris, Caldwell, Warren Co., N. Y., writes of a cave in his vicinity from which ice is often obtained in August. He proposes to make systematic observations in this cave during the coming year.

We can hardly consider an ice cave to be even a crude form of "atmospheric ice machine," as suggested by Mr. McGee. The expansion is not sudden enough nor the range of pressure great enough to produce any appreciable cooling. We must distinguish between the sudden expansion that takes place in the chamber of an air pump and the slow processes of nature.

But let us assume that the present changes continually taking place in nature are accompanied by corresponding changes in temperature at the adiabatic rate. Leaving out of the question the pressure variations due to cyclonic and anticyclonic movements, which, as Mr. McGee has said, must balance each other in the course of the year, we have left differences in the normal pressure from winter to summer, which at sea level amount to only one or two tenths of an inch of mercury. From Professor Bigelow's tables[2] we find that the adiabatic cooling due to a diminution of pressure by 1 inch is only about 5° F., so that the cooling due to expansion from winter to summer mean pressure could hardly amount to more than 1° F. in that part of the cave where the ice is usually found.

Mr. McGee suggests another way in which cooling might be effected. He shows that any marked diminution of the external air pressure must cause a decided flow of air out of the cave; and this outflowing air will expand, especially as it passes through the cave's throat, thereby reducing the temperature at that point. But to make this method effective, it is necessary that the cave be very large and its throat very small; and the ice will be formed, not necessarily at the bottom of the cave, but on the walls at the narrowest part of the outlet, or about the cave's throat. Are there caves in which the ice is formed in this way?—*H. H. K.*

[1] Monthly Weather Review, August, 1901, Vol. XXIX, p. 366.

THE TEMPERATURE OF WATER IN WELLS.

Mr. R. J. Redding, Voluntary Observer, and Director of the Georgia Experiment Station, has sent us the following communication:

I remember seeing it stated in some publication, many years ago, that there is a close correspondence between the mean annual temperature of the water of ordinary wells and the mean annual temperature of the air above the same location. In connection with the statement it was suggested that a traveler, if supplied with a good thermometer, might approximately ascertain the mean annual temperature of the air of any region by simply finding by actual test the temperature of the wells. I have looked in vain for any amplification of the statement in some encyclopedia or other repository of popular information. In a desultory way I have verified the statement quite a number of times but have kept no record of observations, and can only write from memory: In Ocala, Fla., I found the temperature of the well water (February) to average about 72° F.; in Americus, Ga, 66°; in Ellaville, Ga., 66°; in Macon, Ga., 65°; Experiment, Ga., 62°; Atlanta, Ga., 60°; Dahlonega, Ga., 56°; Minneapolis, Minn., 46°. These are all the observations I can recall, but I have made others. On referring to a standard isothermal chart I found a very close correspondence between the temperature above noted and the mean annual temperatures of the air of the same locality. When I have had opportunity to note temperatures of the water of a given well at all seasons of the year I have observed a variation of as much as 2° between the maximum and the minimum, where the well was not deeper than 25 to 30 feet. This range decreases as the depth increases until, according to my limited observations, when the depth of 50 to 60 feet is reached there is no perceptible variation, the temperature of the water remaining uniform the year round. In shallow wells, say 25 to 30 feet, the water was found to be colder by one or two degrees in June than in December, which suggests that it requires about six months for the extreme temperature of the air above to become manifest at that depth. I have thought that this fact explains and justifies the claim often made by well owners, that their well water is colder in midsummer than in midwinter.

The temperature of water in wells must evidently be intimately connected with the temperature of the ground at different depths. Unfortunately, comparatively little attention has been given to this subject in the United States, although it has been quite thoroughly studied in Europe. Perhaps the best series of observations are those that were made at Munich, Bavaria[1] from 1861–1885, and from which a diagram was constructed showing the mean temperature of the ground at different depths for each month of the year. This diagram has

[2] Report of the Chief of the Weather Bureau, 1898–99, Vol. II, pp. 550–553.

[1] Die Bodentemperature an der K. Sternwarte bei München. Von Dr. K. Singer. Anhang. Deutsches Meteorologisches Jahrbuch, 1889. Band XI.

been reproduced in Prof. Wm. M. Davis' Elementary Meteorology, p. 33.

From these observations we learn that while the average annual temperature at Munich for the period 1861–1885 was 6.9° C., the average annual ground temperatures at different depths were as follows.

Depth.	Temperature of ground.
Meters.	° C.
1.29	9.18
2.46	9.16
3.63	9.12
4.80	9.12
5.97	9 06

This indicates a ground temperature nearly 2.3° C. in excess of the air temperature at a depth of 1.3 meters, which is greater than has usually been observed. Thus, Wild[2] concluded after a study of observations at many different places that the annual mean temperature of the ground at a depth of 1 meter exceeds the annual mean of the air temperature by only 1° C., but that this value is by no means constant, but rather has a probable error of 1° C.

In the American Meteorological Journal, Vol. VII, p. 267, Prof. Mark W. Harrington, says: "The temperature of the soil usually increases slowly, and on a simple law as we descend to lower depths." He then gives the following table[3] summarizing the observations made near Edinburgh, and taken from Transactions Royal Society Edinburgh, Vol. VII, p. 204.

Station.	Average annual temperature (from five years' observations).			
	Depth of 3.2 feet.	Depth of 6.4 feet.	Depth of 12.8 feet.	Depth of 25.6 feet.
	°	°	°	°
Observatory	45.49	45.86	46.36	46.87
Experimental Gardens	46.13	46.42	46.76	47.07
Craighleith	45.88	45.92	45.92	46.07

It is therefore safe to say that in general the average annual temperature of the ground a few feet below the surface is slightly warmer than the average annual temperature of the air at the same place, and that it varies but little with distance from the surface. After a certain depth is reached, however, the earth maintains a constant temperature throughout the year, and from this point on there is a marked increase in temperature as we descend. The depth of the upper surface of invariable ground temperatures varies with the geologic formation, as also does the rate of increase of temperature below this level.

In a paper on the Geothermal data from deep Artesian Wells in the Dakotas,[4] N. H. Darton of the United States Geological Survey says:

> In many parts of the world it has been found that the rate of increase of temperature averages about 1° for each 50 feet, below the first 40 feet, in which the temperature is usually regarded as that of the mean annual temperature of the region. In the greater part of the artesian basin of the Dakotas the rate of increase is found to be greatly more than this, attaining at Fort Randall a rate of 1° for each 17½ feet. At this well the temperature of the water is 80° F., or possibly slightly more, but the depth from which it is derived is only 576 feet, which indicates the abnormally high rate of increase.

Since the water collected in wells usually percolates very slowly through strata at about the same level as the bottom of the wells, it follows that in general the average annual temperature of the water thus collected is apt to be a little higher than the average annual temperature of the place, and it may be several degrees higher in wells of great depth.

At 30 and 40 feet below the surface the maximum temperature does not occur until January; and conversely the minimum temperature occurs in July. In consequence the maximum and minimum temperature of water in wells of this depth should occur during these same months, as has been noted by Mr. Redding, provided the well is tightly closed at the top, so as to prevent the cold surface air of winter from gravitating into it. This latter source of cooling is really very important, and to it must often be attributed the many notable exceptions to our rule; we have already called attention to one, in the frozen well at Brandon, Vt.[5]—*H. H. K.*

PERIODICITY IN CLIMATE.

We have often had occasion to maintain that no appreciable permanent change in climate has taken place during the past two hundred years, or since records of temperature and of the flora and fauna, the freezing of rivers, the depth of snow and other climatic phenomena have been kept with sufficient accuracy to justify any rational conclusions. On the other hand, there can be no doubt that large fluctuations take place in the character of the seasons and years, and some of these fluctuations have been called "periodic," although they are not confined to periods of any well-defined length, and ought therefore to be designated as systematic rather than periodic. Thus, Brückner found that the fluctuations of a variety of phenomena grouped themselves roughly about an ideal 35-year period, although no one of them was confined strictly to that. The Editor's idea has always been that the presence of continents, oceans, plateaus, and especially the ice and snow of the polar regions, by contrast with the great oceans of the globe, must introduce systematic irregularities into the general circulation of the atmosphere, which reacting on each other, must produce frequent repetitions of warm or cold, wet or dry seasons in specific regions of the earth. Such repetitions will, for a while, recur at nearly the same interval but by and by at another interval, so that no uniform constant period could possibly represent them all. An article in the Boston Transcript, as quoted in the monthly report of the Iowa Climate and Crop Section for February, 1901, states that during the past year the streams of New England, the Middle States, the Northwestern States, and the Pacific coast have been at their lowest ebb in a century, but the streams of Arizona and Texas, which five years ago were apparently about to disappear entirely, have taken on new life and more water is flowing from them at the present time than for many years past. Of course, sometimes streams may be high in the winter and low in the summer, or vice versa, and the outflow of water or the "run off" does not depend altogether on the rainfall, but largely on the topography of the watershed and on the character of the rainfall, whether it comes in many small showers or a few heavy rains; it also depends upon evaporation, which is a function of the sunshine, the wind, the vegetation, and the soil. With regard to the rainfall, the Transcript says that in New England from 1830 to 1850 there was an abnormal deficiency; from 1850 to 1865 it was normal, and since then it has been far above the average. The Ohio and Mississippi valleys have also had their years of dryness and excessive rain. Now, the years of drought or rain are not the same in New England, the Mississippi Valley, New York, Texas, Arizona, California, and Oregon. The regions of excess and deficit move around from place to place over the

[2] H. Wild. Ueber die Bodentemperaturen in St. Petersburg u. Nukuss Rep. of Meteorologie. Band VII. No. 4. St. Petersburg. 1878. P. 88.

[3] Professor Harrington's table is slightly in error in that he failed to reduce the French feet, in which the depths were indicated, to English feet.

[4] Am. Jour. Sci., 1898, vol. 5, p. 162.

[5] See Monthly Weather Review, August, 1901, p. 370.

country, and in fact, over the whole globe, for, as we have long since had occasion to show, the droughts of India gradually extend eastward, and in the course of three or four years make themselves felt in the United States and Europe, while in the meantime a period of average or abundant rain has come to India. Those who are suffering from drought may rest assured that plenty of water will come in a few years, and those who now have a plenty should husband it for the drought that is sure to come.

These climatic oscillations from one extreme to another, whether it be sunshine, temperature, wind, or rain are essentially a part of the necessary regimen of the earth's atmosphere. The formation of rain undoubtedly depends essentially upon uprising currents of air, cooled by expansion so that they can no longer retain the moisture carried up from the ocean and the ground. Changes in the seasonal rainfall imply changes in the seasonal winds; these changes may be systematic, that is to say, the direct result of the system of forces that acts upon the earth's atmosphere, but by no means necessarily strictly periodic.

The general study of periodicity in the earth's atmosphere must be pursued by following up the logical dynamic reasoning indicated in a general way in the memoir "On long range forecasts" lately read before the American Association for the Advancement of Science, at Denver, and which will be published in the MONTHLY WEATHER REVIEW.—*C. A.*

AURORAL LIGHT.

The following extracts are from the Climate and Crop Section reports, November, 1901:

Laporte, Ind.—About 5:30 p. m. on the 28th, the observer noticed a peculiar light in the western heavens. The sky was covered with broken clouds, through which the light shone.

Huntington, Ind.—A peculiar streak of light was observed in the northwest about 6 p. m. on the 28th.

Stuffenville, Lewis County, Mo.—An aurora observed on the 28th.

The aurora borealis appears in every form, from the most magnificent display to the most insignificant patches of light that appear for a few moments and fade away forever. The above phenomena may well have been of the latter auroral character. Laporte, Ind., is from 50 to 75 miles northwest of Huntington. A northeast wind had been blowing from out an area of high pressure; the sky was covered with cumulostratus clouds at Laporte, but was probably clear at Huntington. These are the conditions that generally accompany auroras and we may assume that there was a faint one on the present occasion, although it was not observed elsewhere in the United States or in Canada.—*C. A.*

ESTABLISHMENT OF THE MARTINIQUE WEATHER SERVICE.

In a letter dated November 11, 1901, M. Merlin, Governor of Martinique, announces the establishment of a "Service of weather warnings which will be located at the military hospital of Fort de France under the direction of the Chief of the Health Service."

The Governor kindly volunteers to transmit monthly copies of observations to the Weather Bureau at Washington, and arrangements have been made for a reciprocal interchange of weather cablegrams between Martinique and the United States during the hurricane season.—*H. H. K.*

SECOND MEXICAN METEOROLOGICAL CONGRESS.

The following interesting program has been announced for the second National Meteorological Congress of Mexico, at the City of Mexico, December 17–20, 1901, in the hall of the Scientific Society "Antonio Alzate."

INAUGURAL SESSION, ENGINEER D. LEANDRO FERNÁNDEZ, MINISTER OF THE INTERIOR, PRESIDING.

December 17, 10 *a. m.*

1. Address of welcome by the vice president of the Society "Alzate."
2. The minister declares the Second National Meteorological Congress open.
3. Report of Prof. D. Mariano Leal, President of the Permanent Committee.
4. Report of the Treasurer of the Permanent Committee.
5. Designation of the presidents for the subsequent sessions and appointment of the committees.

On the evening of the 16th and the morning of the 18th the committees will meet in order to formulate the questions on which the congress will principally report.

December 18, 3:30 *p. m.*

1. Presbyter Severo Diaz, The predictions of Engineer Juan N. Contreras; Examination of meteorological criticism.
2. José Guzman, Principles of forecasting at short intervals.
3. Prof. Luis G. Léon, The Leyden jar as an apparatus for weather predictions.
4. Engineer José M. Romero, Application of the movement of the great aerial currents to weather prediction.

December 19, 9:30 *a. m.*

1. Presbyter Aniceto Castellanos, The volcano Colima and the weather conditions in that region.
2. Prof. Luis G. Léon, Measurement of insolation.
3. Mr. Elpidio López, Climatology of Chignahuapan.
4. Report of the committee on weather prediction.

December 19, 3:30 *p. m.*

1. Dr. Luis E. Ruiz, Hygienic value of local meteorological data.
2. Mrs. Professor Maria Luisa Dominguez, Study of storms and thunderstorms.
3. Prof. Manuel Moreno y Anda, Reduction of the curves of self-registering instruments.
4. Report of the committee on climatology and its application to agriculture.

December 20, 9 *a. m.*

1. Prof. Mariano Leal, A seismographic clock conforming to the decisions of the first Meteorological Congress.
2. Engineer Guillermo B. y Puga, Study of electrical storms.
3. Prof. Raquel Sánchez Suárez, The teaching of meteorology in primary schools.
4. Dr. José Ramirez, Study of the effects of the thunderbolt.
5. Dr. Joaquin Urrutia, (*a*) Improvements effected in the observatory of the State College (Colegio del Estado) at Puebla; (*b*) Comparison of the extreme values given by the instruments of direct observation and those by self-registering instruments.
6. Report of the committee on storms.

December 20, 3:30 *p. m.*

1. Prof. Rafael Aguilar Santillán, Bibliography of Mexican meteorology.
2. Results of the study of instruments shelters, by Mr. Leal and Mr. Moreno y Anda.
3. Prof. Enrique E. Schulz, Memoir on the improvement of the meteorological service in the state of Mexico.
4. Report of the committee on self-registering apparatus.
5. Report of the committee on the popularization of meteorological knowledge and the establishment of new stations.
6. Miscellaneous questions and the nomination of the permanent committee for 1902.
7. The under Secretary of the Interior, Engineer D. Gilberto Montiel y Estrada, will declare the second National Meteorological Congress closed.—*H. H. K.*

CORRIGENDA.

MONTHLY WEATHER REVIEW for September, 1901, page 419, column 2, line 30, after the word "velocity" insert "of the upper current from the resultant velocity."

MONTHLY WEATHER REVIEW for February, 1901, page 56, column 1, line 36, in place of "and St. Kitts, Antigua, and Barbadoes. On the other hand," read "and St. Kitts. Antigua, and Barbados, on the other hand."

Column 2, line 26, after "slopes" insert period (.) in place of comma (,).

Line 38, insert "elevation" before "only;" line 39, for "visitor" read "visitors."

Page 56, column 1, line 2, dele "which."

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Professor of Meteorology.

CHARACTERISTICS OF THE WEATHER FOR NOVEMBER.

The distinguishing feature of the month was, perhaps, its dryness. Less than 50 per cent of the normal precipitation was recorded in almost half the districts, and in but three of the twenty-one districts into which the country has been divided was there more than 100 per cent.

Monthly mean pressure was abnormally high in the interior of the country and unusually low over the Canadian Maritime Provinces and over the north Pacific coast. An interesting feature of the month was the course of an area of low pressure which appeared on the north Pacific coast on the morning of the 9th and reached the New England coast by the evening of the 12th. During the 13th it moved slowly northeastward, reaching eastern Maine by 8 p. m. of that date. It then doubled back on its course and was central the next morning (a. m. of the 14th) in the neighborhood of Quebec, with a pressure reading of 29.04 inches. It remained in that location about thirty-six hours, gradually filling up, and finally disappeared over the mouth of the St. Lawrence on the 17th.

The temperature was below the seasonal average over the eastern third of the country and above in the Rocky Mountain region and thence westward to the Pacific coast.

PRESSURE.

The distribution of monthly mean pressure is graphically shown on Chart IV and the numerical values are given in Tables I and VI.

As will be seen by Chart IV a ridge of high pressure extended from the South Atlantic States northwestward to the lower Missouri Valley and the middle Rocky Mountain region. This ridge of high pressure was due to the fact that the movement of areas of high pressure during the month was southeasterly from the northeastern Rocky Mountain slope by way of the Missouri and middle Mississippi valleys, rather than by way of the southern circuit, viz, southeasterly along the eastern Rocky Mountain slope to the Gulf, and thence northeasterly to the South Atlantic States. The rate of movement over the shorter path is, so far as has been observed by the writer, somewhat greater than over the longer path. Highs that move over the shorter path follow, as a rule, rapidly moving lows that skirt the northern boundary. These lows are generally dry, except while passing over the Great Lakes. Highs that take the longer circuit generally follow southwest lows, which, it may be remembered, give abundant precipitation. The ridge of high pressure above mentioned, which we find on the monthly mean chart, simply expresses the fact that the majority of the highs followed the shorter circuit, and in so doing produced a configuration of the isobars unfavorable to the precipitation of moisture.

TEMPERATURE OF THE AIR.

The distribution of monthly mean surface temperature, as deduced from the records of about 1,000 stations, is shown on Chart VI.

Temperature was below the seasonal average generally east of the Mississippi River, the greatest negative departure, —6°, being along the South Atlantic and Florida coasts. West of the Mississippi River mean temperature was above the seasonal average by amounts ranging from a fraction of a degree to 7° and 8° in the middle and northern Rocky Mountain regions. Maximum temperatures of 90° and over were registered in the lower Rio Grande Valley, and of 80° and above generally throughout the Gulf States, Texas, southern Arizona, and southern California. In the upper Lake region the maximum temperature during the month did not reach 50°. The minimum temperature of the month did not reach freezing in Florida, except in the northern portion, nor along the immediate Gulf coast, in southern Arizona, southern California, nor along the immediate Pacific coast line. Minimum temperatures below zero were recorded in North Dakota and northern New England.

The average temperature for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	10	35.7	− 4.5	− 2.3	− 0.2
Middle Atlantic	12	40.5	− 4.2	− 2.4	− 0.2
South Atlantic	10	49.9	− 4.9	−14.2	− 1.3
Florida Peninsula	7	61.7	− 4.6	−17.3	− 1.6
East Gulf	7	54.9	− 2.4	−10.5	− 1.0
West Gulf	7	58.9	+ 2.4	+11.4	+ 1.0
Ohio Valley and Tennessee	12	42.2	− 2.9	− 4.7	− 0.4
Lower Lake	8	36.6	− 2.5	+ 1.1	+ 0.1
Upper Lake	9	33.6	+ 0.2	+14.0	+ 1.3
North Dakota	8	26.7	− 2.1	+25.8	+ 2.3
Upper Mississippi Valley	11	37.7	+ 0.3	+20.0	+ 1.8
Missouri Valley	10	40.3	+ 3.0	+34.0	+ 3.1
Northern Slope	7	38.5	+ 5.8	+27.0	+ 2.5
Middle Slope	6	46.4	+ 5.1	+22.9	+ 2.1
Southern Slope	6	52.8	+ 4.0	+15.8	+ 1.4
Southern Plateau	15	49.9	+ 4.3	+ 8.1	+ 0.7
Middle Plateau	9	41.7	+ 4.8	+17.3	+ 1.6
Northern Plateau	10	41.8	+ 4.7	+19.3	+ 1.8
North Pacific	9	48.1	+ 3.0	− 0.8	− 0.1
Middle Pacific	5	55.6	+ 2.0	+ 0.9	+ 0.1
South Pacific	4	59.6	+ 2.1	+ 4.5	+ 0.4

In Canada Prof. R. F. Stupart says:

The temperature was from 1° to 4° below average over Ontario and in western Quebec, average or slightly below in the far northern portions of the Northwest Territories, and above average in all the remaining parts of Canada. In British Columbia the excess was as much as 8° in some localities. In Manitoba and over the southern parts of the Northwest Territories it was also considerable, amounting to from 3° to 6°; likewise in the Maritime Provinces it was from 1° to 4°.

PRECIPITATION.

The rainfall was very heavy on the north Pacific coast from northwestern Oregon to British Columbia. The amounts registered in this region varied from 10 to 20 inches. More than the normal rainfall was also recorded on the coast of central California and in the northern portion of the great valley in the same State; also in southeastern New Mexico and northwestern Texas, where an excess of about an inch was registered. Elsewhere precipitation was below the seasonal average by amounts ranging from a fraction of an inch to three inches or over in the lower Ohio Valley.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	10	1.88	47	−2.1	− 3.3
Middle Atlantic	12	1.86	59	−1.3	− 3.9
South Atlantic	10	1.14	38	−1.9	− 2.7
Florida Peninsula	7	0.70	29	−1.7	+ 0.9
East Gulf	7	1.79	49	−1.9	− 3.1
West Gulf	7	1.92	49	−2.0	−10.5
Ohio Valley and Tennessee	12	1.25	34	−2.4	−11.1
Lower Lake	8	2.35	75	−0.8	− 3.3
Upper Lake	9	1.45	59	−1.0	− 6.2
North Dakota	8	0.24	32	−0.5	+ 1.1
Upper Mississippi Valley	11	0.98	45	−1.2	− 9.9
Missouri Valley	10	0.65	45	−0.8	− 5.3
Northern Slope	7	0.30	60	−0.2	+ 1.0
Middle Slope	6	0.50	62	−0.3	− 5.6
Southern Slope	6	1.89	186	+0.5	− 3.5
Southern Plateau	15	0.47	70	−0.2	+ 1.0
Middle Plateau	9	0.50	56	−0.4	− 0.1
Northern Plateau	10	1.37	82	−0.3	− 2.2
North Pacific	9	10.59	149	+3.5	+ 1.6
Middle Pacific	5	3.94	130	+0.9	+ 1.2
South Pacific	4	0.83	62	−0.5	+ 2.1

In Canada Professor Stupart says:

The precipitation, except in a few isolated localities, was below the average in all portions of Canada and in most districts to a considerable amount. The exceptions were: at Montreal and its immediate vicinity, half an inch above the average; the country to northeastward of Lake Superior, somewhat more than average precipitation; and the lower mainland of British Columbia, very much above the average. Westminster recorded 12 inches of rain during the month, and Agassiz almost 11 inches. The chief deficiencies were: in Manitoba from a half to one inch; in the Lake region from 1 to 2 inches; in Quebec from 1 to 2.25 inches, and in the Maritime Provinces from 1 to 3 inches. In the Province of Quebec the precipitation was largely snow. In many parts of Ontario and New Brunswick there was also a good deal of snow. At the close of the month there was from 4 to 10 inches of snow on the ground from Lake Superior to the Ottawa Valley, including the Nipissing and Muskoka districts; in Quebec from 10 to 15 inches and in a large portion of New Brunswick from 4 to 8 inches, but elsewhere in Canada little or none, and what is somewhat remarkable, scarcely any in Manitoba and the Territories.

The snowfall of the month was light except in northern New England and in the Adirondack region of eastern New York. On the Upper Peninsula of Michigan amounts ranging from 10 to 20 inches were recorded. At the end of the month there was no snow on the ground, except a very light cover over northeastern Wisconsin, the Upper Peninsula of Michigan, the northern portion of the lower peninsula, and over Pennsylvania, New York, and northern New England. There was a light covering of snow on the ground in Connecticut and Massachusetts and also in the mountain regions of West Virginia. There was some snow on the ground in the higher elevations of the Rocky Mountain districts.

HAIL.

The following are the dates on which hail fell in the respective States:

Arizona, 12. Arkansas, 22. Colorado, 11. Idaho, 4, 23. Illinois, 11. Indian Territory, 11, 28. Louisiana, 20, 22. Mississippi, 18, 19, 22. Missouri, 22. Nebraska, 3, 18. Nevada, 10, 11. New York, 18. Oregon, 1, 5, 20, 23. Pennsylvania, 12. South Dakota, 2. Texas, 11. Utah, 10, 11. Washington, 1, 5, 7, 15, 16, 20, 23. West Virginia, 4. Wyoming, 20.

SLEET.

The following are the dates on which sleet fell in the respective States:

Alabama, 18. Arizona, 12. California, 10, 15, 18, 29. Colorado, 10, 11, 29, 30. Connecticut, 11, 23, 24. Georgia, 5, 19. Idaho, 20, 22. Illinois, 3, 24. Indiana, 14, 15, 16, 25. Iowa, 2, 3, 24, 26. Kansas, 2, 3, 18. Maine, 12, 14, 24, 25. Maryland, 4, 18, 23, 25, 28, 29. Massachusetts, 11, 19, 23, 24, 25. Michigan, 11, 12, 14, 22, 23. Minnesota, 2, 3, 5, 6, 7, 23, 24, 30. Missouri, 2, 3, 18, 23. Montana, 5. Nebraska, 2, 3, 10. New Hampshire, 8, 12, 24, 25. New Jersey, 14. New Mexico, 12. New York, 5, 10, 11, 16, 19, 22, 23, 24, 25. North Carolina, 19, 23. North Dakota, 22, 23, 30. Ohio 3, 4, 15, 17, 18, 19, 24, 25, 28. South Dakota, 5, 6, 27. Tennessee, 19. Utah, 10, 21, 24, 29. Vermont, 10, 12, 13, 19, 24. Virginia, 23. Washington, 1, 11, 21, 22. West Virginia, 4, 23, 24, 29. Wisconsin, 2, 3, 11, 17, 24.

HUMIDITY.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	74	− 4	Missouri Valley	66	− 5
Middle Atlantic	70	− 6	Northern Slope	70	+ 4
South Atlantic	69	−10	Middle Slope	62	0
Florida Peninsula	76	− 5	Southern Slope	68	+ 7
East Gulf	68	− 9	Southern Plateau	50	+ 4
West Gulf	71	− 2	Middle Plateau	56	+ 2
Ohio Valley and Tennessee	71	− 2	Northern Plateau	70	− 3
Lower Lake	76	0	North Pacific Coast	86	− 1
Upper Lake	79	− 1	Middle Pacific Coast	81	+ 8
North Dakota	82	+ 3	South Pacific Coast	78	+11
Upper Mississippi	70	− 4			

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 353 thunderstorms were received during the current month as against 976 in 1900 and 1,218 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 11th, 74; 2d, 50; 22d, 45.

Reports were most numerous from: Arkansas, 39; Mississippi, 25; Texas, 24.

The number of thunderstorms thus far reported during 1901 is somewhat less than were recorded during the corresponding period of 1900. During the months of June and July, however, the number of thunderstorms in 1901 exceeded by over 2,000 the number reported in 1900. With the exception of these two month, the remainder of the current year has been less productive of thunderstorms than was 1900.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz: 21st to 29th.

In Canada: Thunderstorms were reported as follows: St. Johns, 7, 15; New Westminster, 21.

Auroras were reported as follows: Quebec, 3; Battleford, 5, 12.

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

The averages for the various districts, with departures from the normal, are shown in the table below:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	6.6	+1.0	Missouri Valley	4.1	−0.8
Middle Atlantic	5.5	+0.3	Northern Slope	4.6	0.0
South Atlantic	3.3	−1.2	Middle Slope	4.0	+0.4
Florida Peninsula	3.4	−1.2	Southern Slope	4.1	+0.9
East Gulf	3.6	−0.9	Southern Plateau	3.0	+0.7
West Gulf	4.4	−0.2	Middle Plateau	4.6	+1.0
Ohio Valley and Tennessee	4.7	−1.0	Northern Plateau	6.6	+0 6
Lower Lake	7.4	+0.2	North Pacific Coast	8.1	+1.3
Upper Lake	7.6	+0.6	Middle Pacific Coast	6.0	+2.2
North Dakota	4.3	−1.0	South Pacific Coast	3.8	+0.9
Upper Mississippi	4.0	−1.3			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Block Island, R. I.	10	71	nw.	El Paso, Tex.	12	51	ne.
Do.	13	56	w.	Hatteras, N. C.	6	51	n.
Do.	24	81	ne.	Mount Tamalpais, Cal.	28	56	s.
Do.	26	54	nw.	Nantucket, Mass.	24	68	e.
Boston, Mass.	24	60	ne.	New York, N. Y.	10	58	nw.
Cape Henry, Va.	28	53	n.	Do.	13	62	nw.
Chicago, Ill.	6	50	s.	Do.	14	50	w.
Cleveland, Ohio	12	50	w.	Do.	24	56	ne.
Do.	13	53	nw.	Do.	25	66	nw.
Do.	14	60	w.	Do.	26	72	nw.
Duluth, Minn.	14	56	nw.	Do.	27	53	nw.
Eastport, Me.	25	50	e.	Point Reyes Light, Cal.	10	50	nw.

DESCRIPTION OF TABLES AND CHARTS.

By ALFRED J HENRY, Professor of Meteorology.

For description of tables and charts see page 426 of REVIEW for September, 1901.

TABLE I.—*Climatological data for Weather Bureau Stations, November, 1901.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.									Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.				Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Mean actual, 8 a. m.+8 p. m.÷2.	Mean reduced.	Departure from normal.	Mean max. + mean min. ÷2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.				Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.				
New England.																													
Eastport	76	69	74	29.78	29.87	— .10	35.7	— 4.6										74	1.38	— 2.1								6.6	
Portland, Me.	103	81	117	29.78	29.89	— .12	34.0	— 2.7	54	2	39	11	30	29	18	31	27	77	1.91	— 2.3	13	9,459	n.	50	e.	25	4	9	17	7.0	4.4
Northfield	876	15	65	29.00	29.99	— .05	33.5	— 4.5	64	1	40	12	29	28	19	29	24	72	1.89	— 2.1	7	7,188	nw.	41	nw.	10	8	8	14	6.1	6.2
Boston	125	115	181	29.80	29.94	— .08	37.4	— 5.5	58	1	35	— 8	29	20	32	35	32	81	0.89	— 2.4	12	6,319	n.	38	nw.	10	2	7	21	8.2	8.3
Nantucket	12	43	85	29.91	29.92	— .12	37.2	— 3.4	65	1	44	12	29	31	19	33	29	75	2.41	— 2.2	9	9,048	nw.	60	ne.	24	8	8	14	6.5	1.2
Block Island	26	11	70	29.93	29.96	— .09	40.0	— 4.7	65	1	44	15	29	36	17	36	32	74	0.89	— 2.7	12	12,154	nw.	68	e.	24	3	12	15	7.2	1.3
Narragansett	.....	10	....	.....	.....	.....	39.4	— 5.5	64	2	45	14	28	34	19	36	30	70	2.62	— 1.6	6	15,351	nw.	81	ne.	24	7	11	12	5.7	0.2
New Haven	106	117	140	29.86	29.98	— .08	37.2	— 5.8	64	1	45	9	29	29	24	....	....	....	2.79	— 1.4	7	.....	nw.	....	.....	....	11	10	9	....	2.0
Mid. Atlan. States.							37.2	— 3.9	60	1	44	12	28	30	22	32	26	67	1.61	— 2.3	7	7,320	nw.	43	n.	24	10	8	12	5.4	1.3
Albany	97	102	115	29.90	30.01	— .05	40.5	— 4.2										70	1.86	— 1.3								5.6	
Binghamton	875	79	90	.....	.....	.....	34.5	— 4.7	63	1	41	11	28	28	28	31	28	82	2.02	— 0.9	11	5,234	nw.	24	w.	26	9	3	18	6.6	6.0
New York	314	108	350	29.66	30.01	— .06	32.3	— 5.7	61	1	39	12	28	26	31	....	....	....	2.31	0.0	15	5,377	nw.	28	w.	14	2	9	19	8.1	5.6
Harrisburg	374	94	104	.....	.....	.....	39.7	— 3.7	60	2	45	17	28	35	16	35	29	67	1.31	— 2.5	8	13,464	nw.	72	nw.	26	10	8	12	5.6	0.6
Philadelphia	117	108	184	29.92	30.04	— .06	38.5	— 3.9	64	1	45	22	28	32	24	....	....	....	1.29	— 1.5	6	6,956	nw.	39	ne.	24	7	9	14	6.1	0.4
Scranton	805	111	119	29.16	30.06	— .02	41.2	— 2.7	62	2	48	20	28	35	22	36	29	63	2.64	— 0.6	6	8,872	nw.	48	ne.	24	10	8	12	5.6	1.2
Atlantic City	52	68	76	29.98	30.04	— .04	34.6	.....	62	1	41	16	28	28	33	30	25	70	2.58	.....	8	6,348	nw.	32	nw.	14	6	4	20	7.2	3.8
Cape May	17	47	51	30.05	30.07	— .02	40.6	— 4.1	64	1	48	20	28	34	26	36	32	73	2.09	— 1.4	3	8,664	nw.	41	se.	24	8	12	10	5.4	T.
Baltimore	123	68	82	29.93	30.06	— .04	42.2	— 4.4	65	1	48	24	28	36	24	38	....	....	2.32	— 1.0	5	7,717	nw.	38	e.	24	7	15	8	5.2	0.5
Washington	112	59	76	29.96	30.09	— .02	41.8	— 3.6	65	2	49	24	29	35	31	37	32	71	2.26	— 0.8	4	4,299	w.	32	ne.	24	10	8	12	5.6	0.1
Cape Henry	.....	5	59	.....	.....	.....	40.6	— 3.9	69	1	50	20	30	32	36	35	28	64	2.33	— 0.5	4	6,341	nw.	36	w.	14	11	8	11	5.4	0.2
Lynchburg	681	83	88	29.34	30.10	— .02	46.5	— 5.4	73	1	53	24	29	40	26	....	....	....	1.50	— 2.1	5	11,897	n.	53	n.	28	16	7	7	4.2	
Norfolk	91	102	111	30.00	30.10	— .00	41.7	— 4.6	76	1	52	22	22	32	38	35	29	67	1.47	— 1.5	4	3,574	nw.	28	nw.	12	18	6	6	3.9	T.
Richmond	144	82	90	.....	.....	.....	46.2	— 4.1	78	1	53	22	29	40	27	41	36	71	0.81	— 2.3	5	6,832	n.	34	sw.	12	17	5	8	4.0	
S. Atlantic States.							44.1	.....	78	1	53	19	29	35	32	....	....	....	1.37	.....	5	4,121	n.	24	nw.	25	17	6	7	3.7	
Charlotte	773	68	76	29.30	30.14	+ .03	42.9	— 4.9										69	1.14	— 1.9								3.7	
Hatteras	11	17	86	30.09	30.10	+ .02	45.8	— 4.1	77	1	55	27	17	36	28	38	31	68	0.98	— 2.1	4	4,680	n.	29	sw.	12	19	3	8	3.3	
Kittyhawk	8	12	30	.....	.....	.....	50.0	— 5.6	72	1	54	32	29	46	17	47	44	82	2.17	— 3.0	7	12,889	n.	51	n.	6	19	7	4	3.5	
Raleigh	376	93	101	29.74	30.14	.00	47.1	— 6.4	70	12	54	24	29	40	26	....	....	....	2.10	— 1.9	4	.....	nw.	....	.....	....	19	5	6	3.5	
Wilmington	78	82	90	30.04	30.13	+ .03	45.0	— 4.6	77	1	55	30	29	35	34	38	32	67	0.82	— 1.4	6	4,530	nw.	31	sw.	12	19	5	6	3.5	
Charleston	48	14	92	30.08	30.14	+ .04	48.7	— 5.9	78	1	59	26	29	39	30	41	35	68	1.16	— 1.3	4	5,679	nw.	34	w.	24	20	5	5	2.9	
Columbia	351	114	122	29.76	30.15	+ .05	53.2	— 4.4	78	1	61	32	17	45	22	45	39	66	0.79	— 2.2	7	7,176	n.	27	ne.	10	18	7	5	3.0	
Augusta	180	89	103	29.95	30.15	+ .05	49.0	— 5.8	80	1	59	27	29	39	31	41	33	60	0.95	— 1.4	5	5,759	nw.	33	sw.	12	17	7	6	3.9	3.3
Savannah	65	79	89	30.08	30.14	+ .02	49.8	— 3.6	79	1	61	25	18	39	34	42	37	72	1.09	— 2.0	5	4,064	nw.	28	w.	12	19	6	5	3.2	
Jacksonville	43	69	84	30.09	30.14	+ .06	54.3	— 3.5	81	1	63	31	17	45	28	46	40	68	1.01	— 1.3	5	5,111	n.	31	w.	23	21	6	3	2.9	
Florida Peninsula.							56.4	— 5.0	79	12	66	33	17	47	29	49	44	73	0.36	— 2.2	5	4,723	nw.	29	w.	23	20	4	6	3.4	
Jupiter	28	13	55	30.05	30.08	+ .03	66.1	— 5.0										76	0.56	— 2.0								3.4	
Key West	22	43	50	30.07	30.09	+ .08	66.6	— 5.2	86	5	74	42	17	59	26	60	56	77	0.94	— 2.5	7	7,048	nw.	34	n.	2	15	13	2	3.7	
Tampa	34	60	67	30.09	30.13	+ .06	70.4	— 3.8	81	4	74	57	18	67	13	64	61	74	0.25	— 2.0	4	8,484	ne.	32	nw.	23	22	8	0	2.7	
East Gulf States.							61.4	— 6.0	83	1	71	38	18	52	27	54	51	78	0.48	— 1.5	5	3,841	n.	25	w.	23	16	10	4	3.7	
Atlanta	1,174	190	216	28.91	30.18	+ .04	54.0	— 2.4										68	1.79	— 1.9								3.6	
Macon	370	98	99	.....	.....	.....	47.2	— 4.6	76	1	56	25	17	38	28	39	31	59	0.99	— 2.6	4	9,941	nw.	37	nw.	12	15	10	5	4.1	T.
Pensacola	56	78	96	.....	.....	.....	49.2	.....	78	1	61	22	17	38	36	....	....	....	0.42	.....	4	4,438	nw.	26	nw.	14	16	6	8	3.6	
Mobile	57	88	96	30.13	30.20	+ .10	57.4	— 1.8	79	2	67	37	16	48	25	....	....	....	1.22	— 2.6	3	6,625	n.	32	e.	22	20	7	3	3.4	
Montgomery	223	100	112	29.95	30.19	+ .06	54.4	— 3.5	81	2	66	32	17	43	32	47	41	70	1.09	— 2.7	4	4,951	n.	36	s.	22	21	4	5	3.2	
Meridian	375	84	93	.....	.....	.....	51.7	— 3.5	80	3	63	28	17	40	34	43	37	66	2.23	— 1.2	7	4,130	n.	24	se.	19	16	9	5	3.5	
Vicksburg	247	65	76	29.92	30.19	+ .06	49.6	— 3.8	79	2	62	23	29	37	40	....	....	....	1.97	— 1.2	6	3,302	n.	32	nw.	3	14	8	8	3.9	
New Orleans	51	88	121	30.13	30.19	+ .11	55.0	— 0.4	81	2	65	34	16	45	29	48	43	75	2.14	— 2.7	5	4,511	se.	22	n.	3	14	11	5	3.6	
Port Eads	.....	27	...	.....	.....	.....	59.4	— 1.3	80	1	67	43	16	52	24	51	46	71	2.78	— 1.4	8	5,936	ne.	34	nw.	22	18	7	5	3.6	
West Gulf States.							64.2	— 0.6	81	1	71	47	17	57	24	....	....	....	1.92	— 0.9	6	.....	ne.	....	.....	....	10	11	9	....	
Shreveport	249	77	84	29.92	30.19	+ .08	55.9	+ 2.4										71	1.92	— 2.0								4.4	
Fort Smith	457	79	94	29.68	30.18	+ .09	55.7	+ 1.1	81	2	66	32	16	45	34	50	46	78	2.57	— 2.2	6	4,540	se.	27	se.	3	14	7	9	4.3	
Little Rock	357	93	100	29.81	30.20	+ .09	52.5	+ 3.2	78	1	63	27	16	42	37	44	38	65	2.19	— 1.5	7	5,633	e.	32	nw.	3	9	17	4	4.2	
Corpus Christi	18	48	58	30.14	30.16	+ .08	52.4	+ 1.6	78	2	62	31	16	42	30	44	36	62	2.81	— 2.5	5	4,889	nw.	39	nw.	12	16	7	7	4.3	
Fort Worth	670	106	114	29.44	30.17	+ .06	66.8	+ 3.8	83	3	73	48	14	60	24	61	59	80	0.66	— 2.4	4	6,772	se.	30	n.	14	9	15	6	4.4	
Galveston	54	106	112	30.10	30.15	+ .07	57.3	.....	79	11	68	34	16	47	30	49	44	69	2.10	.....	3	8,080	s.	36	s.	22	17	7	6	3.6	
Palestine	510	73	79	29.64	30.19	+ .08	63.7	+ 1.3	77	2	68	46	16	59	16	59	56	79	2.06	— 2.3	5	8,630	se.	38	n.	14	11	10	9	5.1	
San Antonio	701	67	77	29.41	30.16	+ .07	58.0	+ 1.8	78	*	67	36	16	49	30	50	45	71	2.54	— 1.9	5	5,079	s.	26	n.	22	11	14	5	4.8	
Ohio Val. & Tenn.							63.2	+ 4.2	83	2	74	39	6	53	36	54	48	67	0.64	— 1.4	3	5,143	se.	28	n.	3	11	15	4	4.4	
Chattanooga	762	106	112	29.38	30.21	+ .08	42.2	— 2.9										71	1.25	— 2.4								4.7	
Knoxville	1,004	10	88	29.11	30.21	+ .05	46.2	— 3.7	76	1	56	23	17	36	26	38	31	62	1.10	— 2.7	4	4,839	nw.	36	nw.	12	13	15	2	3.7	T.
Memphis	397	140	154	29.78	30.22	+ .11	42.8	— 3.8	73	3	53	23	29	32	35	36	31	73	1.30	— 2.5	3	4,869	n.	34	nw.	12	14	9	7	4.0	
Nashville	546	128	134	29.62	30.22	+ .11	50.7	+ 0.8	77	2	60	30	17	42	27	44	37	66	1.52	— 3.2	6	6,583	nw.	36	nw.	3	19	4	7	3.1	
Lexington	989	75	102	.....	.....	.....	45.2	— 2.8	73	2	56	22	17	35	36	38	32	67	0.85	— 3.0	6	4,458	nw.	28	nw.	12	20	5	5	2.9	
Louisville	525	114	136	29.62	30.21	+ .10	40.2	— 3.4	74	3	49	22	5	32	36	....	....	....	1.73	— 2.0	5	7,298	nw.	38	nw.	12	15	10	5	3.9	T.
Evansville	434	72	82	.....	.....	.....	42.6	— 2.7	72	3	52	24	18	34	34	37	32	73	1.17	— 2.9	5	5,689	se.	32	w.	14	19	4	7	3.4	
Indianapolis	822	154	164	29.27	30.18	+ .09	43.8	.....	73	11	53	23	17	35	30	....	....	....	1.71	.....	5	4,710	nw.	39	s.	11	24	3	3	1.8	
Cincinnati	628	152	157	29.49	30.19	+ .09	39.2	— 1.7	69	11	46	22	4	32	33	34	28	66	1.17	— 2.7	7	7,162	nw.	48	s.	11	12	7	11	5.5	T.
Columbus	824	87	100	29.26	30.17	+ .08	41.0	— 2.9	74	3	49	24	5	33	38	35	30	69	0.74	— 2.6	5	5,914	nw	30	sw.	11	9	10	11	5.3	T.
Pittsburg	842	116	123	29.19	30.12	+ .02	38.6	— 2.6	70	3	46	19	28	31	34	33	28	72	0.59	— 2.7	9	5,922	nw.	31	sw.	11	6	8	16	6.8	0.8
Parkersburg	638	77	84	29.48	30.19	+ .05	39.2	— 3.6	70	3	45	23	28	33	30	35	30	73	1.80	— 0.7	10	5,134	nw.	24	nw.	14	7	7	16	6.8	3.0
Elkins	1,940	41	50	28.03	30.16	+ .03	38.7	— 5.3	72	3	47	21	28	30	37	34	31	79	1.78	— 1.4	9	4,334	w.	36	nw.	12	7	9	14	6.4	0.7
Lower Lake Region.							32.4	.....	70	3	42	8	29	23	50	29	26	83	2.90	.....	13	3,483	w.	31	w.	12	4	10	16	7.5	11.7
Buffalo	767	178	206	29.21	30.06	+ .03	36.6	— 2.5										76	2.35	— 0.8								7.4	
Oswego	335	76	87	29.64	30.02	— .08	36.2	— 2.0	66	3	42	16	28	31	29	33	29	76	2.87	— 0.7	18	11,656	w.	48	w.	7	1	9	20	8.4	10.2
Rochester	523	81	90	29.46	30.05	+ .01	34.2	— 4.3	58	1	40	13	28	29	24	32	28	77	3.87	+ 0.5	17	9,726	nw	39	nw.	12	5	2	23	8.1	17.0
Erie	713	92	102	29.29	30.08	+ .04	33.7	— 3.7	60	3	39	14	28	28	31	28	80	2.63	— 0.2	18	7,390	w.	32	nw.	14	6	4	20	7.4	14.1
Cleveland	762	190	201	29.27	30.11	+ .04	38.0	— 3.0	66	3	43	19	28	33	25	35	32	81	2.96	— 1.2	21	9,860	nw	38	nw.	12	4	4	22	8.2	4 7
Sandusky	629	62	70	29.43	30.13	+ .07	38.2	— 1.5	67	3	43	24	6	33	29	34	29	71	2.42	— 0.5	14	13,591	sw.	60	w.	14	4	5	21	7.7	4 2
Toledo	628	128	127	29.44	30.14	+ .09	38.1	— 2.3	70	3	44	21	28	32	31	34	29	73	1.79	— 1.3	12	7,309	nw.	40	nw.	12	6	9	15	6.8	1.8
Detroit	730	160	190	29.30	30.12	+ .07	37.6	— 1.6	67	3	44	17	28	31	29	33	28	74	1.25	— 1.6	10	7,554	w.	36	nw.	14	8	9	13	6.3	0.6
Upper Lake Region.							36.4	— 1.7	68	3	42	16	28	31	26	33	29	77	1.00	— 1.7	7	8,665	nw.	37	nw.	12	5	11	14	6.7	T.
Alpena	609	63	80	29.39	30.08	+ .06	35.6	+ 0.2										79	1.45	— 1.0								7.6	
Escanaba	612	43	57	29.41	30.10	+ .09	32.8	0.0	58	11	38	12	28	27	30	30	27	80	0.85	— 2.0	9	8,884	nw.	34	nw.	14	2	5	23	8.7	4.6
Grand Haven	632	55	92	29.41	30.11	+ .09	32.1	+ 0.9	53	2	38	15	5	26	28	30	28	86	1.84	— 0.5	11	7,646	nw.	34	n.	22	4	2	24	8.2	2.5
Houghton	668	66	74	.....	.....	.....	36.8	— 0.3	62	2	43	25	27	31	30	34	30	79	1.75	— 1.2	14	9,674	nw.	38	sw.	28	4	6	20	7.7	3.6
Marquette	734	79	116	29.26	30.08	+ .07	30.9	.....	59	2	37	11	26	24	29	....	....	....	2.65	.....	16	5,088	nw.	30	w.	1	1	5	24	8.8	17.2
Port Huron	638	70	120	29.40	30.12	+ .08	31.9	+ 0.5	56	2	36	18	23	27	24	29	25	79	3.82	+ 1.1	19	9,294	nw.	41	nw.	14	1	9	20	8.4	29.8
Sault Ste. Marie	614	40	61	29.36	30.05	+ .07	35.3	— 1.1	62	3	42	16	28	29	27	32	29	82	1.19	— 1.6	10	9,617	nw.	40	nw.	14	5	9	16	7.0	0.8
Chicago	823	241	274	29.24	30.15	+ .10	30.8	+ 0.5	50	3	37	7	26	25	26	28	25	83	1.33	— 1.2	12	7,515	nw.	36	nw.	14	3	4	23	8.5	5.6
Milwaukee	681	134	142	29.38	30.14	+ .10	37.6	— 0.8	66	11	44	16	4	31	34	34	30	76	0.85	— 1.9	8	10,983	nw.	50	s.	6	11	8	11	5.6	0.1
Green Bay	617	49	57	29.44	30.13	+ .09	36.2	+ 1.0	65	11	45	17	4	29	30	32	29	77	0.75	— 1.3	6	7,677	w.	36	se.	10	7	5	18	7.0	0 5
Duluth	702	95	115	29.33	30.13	+ .10	33.2	+ 1.1	63	2	40	13	26	29	29	34	29	72	0.80	— 1.6	8	6,345	n.	29	n.	3	4	7	19	7.9	2.8
North Dakota.							29.4	0.0	52	2	36	11	16	23	21	26	23	79	1.28	— 0.3	8	7,568	sw.	56	nw.	14	9	6	15	6.3	2.8
Moorhead	935	54	60	29.10	30.17	+ .09	27.3	+ 1.9										82	0.44	— 0.3								4.3	
Bismarck	1,674	16	29	28.32	30.18	+ .10	26.6	+ 2.4	55	28	36	6	16	17	33	23	21	86	T.	— 0.9	0	7,909	nw.	36	se.	23	14	12	4	4.1	T.
Williston	1,875	15	31	28.06	30.14	+ .06	29.6	+ 3.7	64	1	40	7	7	19	37	24	19	72	0.30	— 0.4	1	5,803	nw.	36	nw.	2	12	11	7	4.8	3 0
							25.8	— 0.3	58	1	37	0	7	15	38	23	21	87	1.02	+ 0.5	3	4,790	nw.	38	nw.	2	21	8	1	3.9	10.5

TABLE I.—*Climatological data for Weather Bureau Stations, November*, 1901—Continued.

Stations.	Elevation of instruments: Barometer above sea level, feet.	Elevation of instruments: Thermometers above ground.	Elevation of instruments: Anemometer above ground.	Pressure, in inches: Mean actual, 8 a. m. + 8 p. m. + 2.	Pressure, in inches: Mean reduced.	Pressure, in inches: Departure from normal.	Temperature of the air, in degrees Fahrenheit: Mean max. + mean min. + 2.	Temperature: Departure from normal.	Temperature: Maximum.	Temperature: Date.	Temperature: Mean maximum.	Temperature: Minimum.	Temperature: Date.	Temperature: Mean minimum.	Temperature: Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches: Total.	Precipitation: Departure from normal.	Precipitation: Days with .01, or more.	Wind: Total movement, miles.	Wind: Prevailing direction.	Wind: Maximum velocity: Miles per hour.	Wind: Maximum velocity: Direction.	Wind: Maximum velocity: Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
Upper Mis. Valley.							37.7	+ 0.3										70	0.98	— 1.2									4.0	
Minneapolis	.....	99	108	.....	.....	.....	31.0	+ 1.3	58	1	40	12	25	22	28	....	....	....	1.00	+ 0.3	5	9,055	nw.	37	s.	10	13	7	10	.....	3.2
St. Paul	837	114	124	29.21	30.15	+ .09	31.0	+ 1.1	57	2	39	13	16	23	26	27	23	73	1.60	+ 0.5	5	6,206	nw.	31	nw.	11	14	7	9	4.9	2.3
La Crosse	714	70	78	.....	.....	.....	33.4	0.0	65	2	41	12	5	26	34	....	....	....	0.74	— 0.7	3	5,677	s.	28	s.	2	8	11	11	5.5	5.8
Davenport	606	71	79	29.48	30.16	+ .08	36.8	0.0	68	11	46	15	16	28	35	31	26	72	0.79	— 1.3	4	5,414	w.	32	w.	6	18	6	6	3.6	T.
Des Moines	861	84	88	29.24	30.21	+ .12	37.6	+ 1.2	67	1	48	13	4	27	33	33	29	75	0.40	— 1.3	1	5,509	nw.	42	sw.	6	17	9	4	4.1	2.0
Dubuque	698	101	109	29.39	30.18	+ .11	35.3	+ 0.3	68	11	44	12	4	26	39	30	25	74	0.67	— 1.4	4	5,859	nw.	34	nw.	3	10	12	8	5.0	4.9
Keokuk	614	63	78	29.49	30.17	+ .09	39.2	+ 0.4	70	11	49	14	17	30	35	33	28	71	0.80	— 1.3	4	5,568	nw.	36	sw.	11	18	6	6	3.1	0.1
Cairo	356	87	93	29.82	30.22	+ .13	46.2	0.0	76	11	56	22	17	36	29	39	32	66	1.77	— 2.4	5	5,631	n.	34	nw.	3	18	7	5	3.7	
Springfield, Ill.	644	82	93	29.47	30.19	+ .10	39.4	— 1.5	71	11	48	18	16	30	32	33	27	66	1.06	— 1.9	7	6,802	nw.	30	nw.	3	18	7	5	3.6	
Hannibal	534	75	110	.....	.....	.....	40.4	+ 0.2	75	11	52	9	17	28	40	....	....	....	0.74	— 1.4	5	6,499	w.	48	s.	11	13	12	5	3.9	0.1
St. Louis	567	111	210	29.56	30.19	+ .09	44.0	+ 0.4	76	11	53	23	17	35	32	38	31	65	1.21	— 1.9	4	6,820	s.	36	nw.	3	20	6	4	2.9	T.
Missouri Valley.							40.3	+ 3.0										66	0.65	— 0.8									4.1	
Columbia	784	4	84	.....	.....	.....	42.4	— 0.6	75	11	55	13	17	30	40	....	....	....	0.80	— 2.1	4	6,271	nw.	36	sw.	11	15	7	8	3.9	T.
Kansas City	963	78	95	29.15	30.20	+ .10	44.8	+ 4.1	74	2	54	24	15	35	31	38	30	60	0.60	— 1.6	1	6,085	nw.	35	s.	11	16	5	9	4.1	0.1
Springfield, Mo	1,324	100	103	28.75	30.18	+ .09	46.4	+ 2.9	74	11	56	21	16	37	31	40	33	66	2.58	— 1.0	5	7,469	nw.	33	nw.	3	18	6	6	3.7	
Topeka	.....	81	.....	.....	.....	.....	44.2	+ 3.0	71	2	55	22	16	33	34	....	....	....	0.65	— 0.6	4	5,925	s.	34	s.	10	11	10	9	4.7	0.5
Lincoln	1,189	75	84	28.86	30.17	+ .05	40.8	+ 2.7	67	30	52	19	16	30	32	34	29	71	0.41	— 0.3	3	7,260	n.	39	nw.	2	15	10	5	3.8	T.
Omaha	1,105	115	121	28.96	30.17	+ .06	40.2	+ 3.6	67	2	50	19	16	30	35	34	30	72	0.56	— 0.5	4	6,060	n.	35	n.	2	13	11	6	4.5	1.4
Valentine	2,598	39	40	27.33	30.12	+ .01	39.4	+ 5.1	75	10	54	13	15	25	47	30	22	59	0.05	— 0.4	2	6,847	w.	49	nw.	6	20	5	5	3.2	0.5
Sioux City	1,135	96	164	.....	.....	.....	36.8	+ 2.5	69	1	46	15	16	27	34	....	....	....	0.56	— 0.2	3	8,847	nw.	44	nw.	6	16	7	7	3.9	0.2
Pierre	1,572	43	50	28.43	30.16	+ .05	36.2	+ 4.3	75	1	48	14	7	25	41	29	22	65	0.18	— 0.3	3	4,876	se.	36	n.	10	12	12	6	4.3	1.8
Huron	1,306	56	67	28.72	30.18	+ .07	32.2	+ 2.7	72	1	45	6	7	19	45	26	21	72	0.08	— 0.5	2	8,459	nw.	39	se.	10	10	15	5	4.8	0.7
Yankton†	1,233	52	58	.....	.....	.....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Northern Slope.							38.5	+ 5.8										70	0.30	— 0.2									4.6	
Havre	2,505	46	47	27.34	30.06	— .03	34.4	+ 4.5	65	1	46	3	22	23	48	30	27	81	0.84	+ 0.2	4	6,692	sw.	44	sw.	1	9	16	5	5.0	5.4
Miles City	2,371	42	50	27.51	30.07	— .06	37.3	+ 6.0	66	1	49	14	3	25	36	33	31	91	0.42	0.0	2	4,004	s.	40	nw.	30	19	9	2	3.2	1.0
Helena	4,110	88	93	25.83	30.11	— .03	39.5	+ 8.0	60	7	48	24	25	31	29	32	24	57	0.16	— 0.5	3	5,088	sw.	44	sw.	5	4	6	20	7.0	T.
Kalispell	2,965	45	51	26.96	30.12	— .02	36.7	.....	53	5	44	23	11	29	23	33	29	80	0.73	.....	10	3,284	w.	33	sw.	1	4	8	18	7.4	1.8
Rapid City	3,234	46	50	26.66	30.08	— .05	40.7	+ 5.8	75	1	54	18	15	27	46	32	24	62	0.14	— 0.2	2	5,434	nw.	34	nw.	10	20	8	2	2.8	1.4
Cheyenne	6,088	56	64	24.06	30.18	+ .05	40.0	+ 5.8	66	28	54	12	3	26	45	30	19	48	T.	— 0.3	0	7,776	nw.	46	nw.	2	14	15	1	3.4	T.
Lander	5,372	26	36	24.71	30.22	+ .03	36.0	+ 4.4	67	1	52	12	25	20	47	29	24	73	0.22	— 0.6	2	2,771	sw.	36	sw.	5	10	17	3	4.3	2.0
North Platte	2,821	43	52	27.18	30.20	+ .07	41.3	+ 6.1	69	10	56	15	15	27	41	33	26	66	0.30	0.0	2	5,539	w.	44	nw.	6	16	12	2	4.0	
Middle Slope.							46.4	+ 5.1										62	0.50	— 0.3									4.0	
Denver	5,291	79	151	24.80	30.18	+ .02	45.6	+ 7.6	72	1	61	20	19	30	45	33	20	44	T.	— 0.6	0	5,764	sw.	45	nw.	23	18	9	3	3.2	
Pueblo	4,685	80	86	25.37	30.15	+ .04	43.8	+ 5.0	74	10	61	17	16	26	53	33	22	48	0.01	— 0.3	1	4,106	nw.	36	w.	23	13	14	3	3.9	
Concordia	1,398	42	47	28.67	30.19	+ .07	43.8	+ 3.8	71	10	55	19	15	32	38	37	33	76	0.44	— 0.4	4	4,670	s.	30	s.	10	14	10	6	3.9	
Dodge	2,509	44	52	27.50	30.17	+ .08	46.2	+ 6.0	76	29	61	22	15	32	44	37	32	69	0.04	— 0.4	2	6,619	se.	37	sw.	10	17	11	2	3.8	
Wichita	1,358	78	85	28.72	30.18	+ .07	47.5	+ 4.7	71	1	58	26	16	37	32	40	34	68	1.16	+ 0.2	3	5,872	s.	30	n.	2	15	8	7	3.9	
Oklahoma	1,214	54	62	28.86	30.17	+ .08	51.2	+ 3.3	79	11	62	26	23	40	32	44	37	65	1.38	— 0.5	4	7,128	n.	36	n.	3	8	16	6	5.2	
Southern Slope.							52.4	+ 4.2										68	1.75	+ 0.9									4.1	
Abilene	1,738	45	54	28.32	30.16	+ .05	56.6	+ 4.6	81	11	67	33	4	46	30	48	43	70	1.50	+ 0.1	4	6,166	se.	32	n.	3	13	13	4	4.2	
Amarillo	3,676	54	61	26.34	30.15	+ .05	48.2	+ 3.7	78	10	60	31	4	37	38	40	34	67	2.00	+ 1.7	4	10,462	sw.	47	n.	2	13	13	4	4.0	
Southern Plateau.							53.2	+ 4.0										50	0.35	— 0.2									3.0	
El Paso	3,762	10	110	26.28	30.13	+ .06	55.0	+ 3.5	79	10	68	35	24	42	39	44	37	62	1.05	+ 0.6	3	6,040	nw.	51	ne.	12	14	15	1	3.6	
Santa Fe	7,013	47	50	23.35	30.17	+ .07	42.8	+ 5.2	62	6	53	24	14	33	29	33	26	60	0.73	0.0	4	3,746	ne.	25	s.	1	23	6	1	2.5	2.4
Flagstaff	6,907	12	25	23.44	30.26	.....	40.0	+ 1.4	64	23	56	14	18	24	43	33	....	....	0.09	— 1.0	3	.....	e.	....	.....	....	15	15	0	3.5	T.
Phoenix	1,108	47	57	28.86	30.03	+ .01	63.9	+ 6.0	86	5	79	44	22	49	40	50	40	49	0.01	— 0.4	1	2,193	e.	22	ne.	12	17	7	6	3.6	
Yuma	141	16	50	29.84	29.98	— .01	65.8	+ 3.5	87	6	81	42	19	50	39	51	38	41	0.00	— 0.3	0	3,398	n.	23	n.	12	23	6	1	1.5	
Independence	3,910	51	58	26.06	30.05	— .03	52.0	+ 4.2	76	4	65	29	19	39	31	40	25	36	0.22	0.0	2	3,964	nw.	30	s.	29	14	16	0	3.1	
Middle Plateau.							43.6	+ 4.2										56	0.54	— 0.4									4.6	
Carson City	4,730	82	92	25.35	30.15	+ .03	44.1	+ 2.7	74	5	57	22	13	31	42	38	33	69	0.87	— 0.6	6	4,372	sw.	48	sw.	23	7	10	13	6.1	
Winnemucca	4,344	59	70	25.70	30.13	— .05	41.6	+ 4.5	61	5	55	17	13	28	44	35	28	61	0.33	— 0.2	5	6,235	sw.	36	sw.	23	8	9	13	6.0	
Modena	5,479	10	38	24.72	30.26	. .....	42.0	.....	67	5	58	16	13	26	42	31	20	48	0.01	.....	1	6,280	w	42	sw.	10	14	11	5	3.7	
Salt Lake City	4,366	105	110	25.74	30.20	— .01	45.9	+ 6.1	67	9	55	29	12	37	27	38	30	57	0.92	— 0.4	5	3,542	se.	36	sw.	10	15	9	6	3.8	
Grand Junction	4,608	43	51	25.51	30.24	+ .03	42.8	+ 3.4	67	9	58	19	22	28	37	32	21	47	0.02	— 0.6	2	2,689	se.	22	nw.	2	13	14	3	3.5	T.
Northern Plateau.							43.2	+ 4.6										70	1.10	— 0.3									6.6	
Baker City	3,471	53	58	26.51	30.15	— .03	40.9	+ 4.1	58	28	49	20	11	33	26	34	27	62	0.70	— 0.2	7	4,048	se	23	se.	22	2	5	23	7.9	0.2
Boise	2,739	61	68	27.28	30.17	— .04	44.8	+ 6.3	67	29	56	22	11	34	31	38	31	62	0.28	— 1.0	6	2,537	nw.	18	w.	23	6	16	8	5.8	
Lewiston	757	52	61	.....	.....	.....	44.2	+ 1.9	65	12	52	28	14	36	27	....	....	....	1.07	— 0.8	9	2,320	e.	30	w.	1	4	12	14	6.6	
Pocatello	4,482	46	54	25.58	30.18	— .02	42.2	+ 9.2	63	5	53	20	13	31	37	36	30	64	0.72	— 0.6	6	6,923	se.	28	s.	22	10	13	7	5.2	
Spokane	1,943	99	107	28.02	30.11	— .03	41.0	+ 3.2	57	27	48	25	11	34	19	38	34	79	2.61	+ 0.9	13	3,909	s.	30	sw.	5	1	8	21	8.2	T.
Walla Walla	1,000	65	73	28.99	30.08	— .11	45.8	+ 2.8	70	4	53	29	26	38	31	43	41	85	1.19	— 0.2	11	3,797	s.	28	w.	22	4	17	9	6.1	
N. Pac. Coast Reg.							48.1	+ 3.0										86	10.59	+ 3.5									8.1	
Neah Bay	50	7	50	29.87	29.93	— .08	48.5	+ 2.1	62	28	52	38	10	45	12	47	46	91	23.17	+ 9.2	29	6,389	e.	36	w.	5	0	4	26	9.1	
Port Crescent	259	14	20	.....	.....	.....	44.0	+ 1.7	60	28	50	29	8	38	19	....	....	....	11.70	+ 5.3	25	1,716	sw.	36	sw.	16	0	6	24	8.7	
Seattle	123	114	121	29.88	30.02	— .05	49.2	+ 4.3	61	27	54	38	8	44	19	46	44	83	6.17	+ 0.5	22	4,343	se.	27	se.	16	0	12	18	8.0	
Tacoma	213	113	120	.....	.....	.....	47.6	+ 3.4	61	27	53	31	8	42	21	....	....	....	9.62	+ 3.5	20	4,187	sw.	30	sw.	29	0	8	22	8.3	
Astoria	20	57	64	.....	.....	.....	49.8	+ 2.9	64	28	55	38	8	44	19	....	....	....	14.56	+ 5.0	25	.....	ne.	....	.....	....	0	8	22	8.2	
Portland, Oreg	154	208	213	29.89	30.05	— .05	48.4	+ 2.8	62	4	54	35	14	43	21	46	44	87	6.14	+ 0.4	21	5,958	s.	44	s.	22	0	10	20	8.6	
Roseburg	518	56	67	29.50	30.08	— .05	49.0	+ 3.8	66	22	57	32	13	41	26	46	44	84	2.76	— 0.9	15	1,787	nw.	28	sw.	15	8	13	9	5.6	
Mid. Pac. C'st Reg.							55.6	+ 2.0										81	3.94	+ 0.9									6.0	
Eureka	62	60	69	30.02	30.08	— .01	53.0	+ 2.4	70	28	58	38	11	48	23	50	47	81	3.96	— 0.1	13	3,680	se.	29	se.	28	7	12	11	5.9	
Mount Tamalpais	2,375	11	18	27.61	30.10	+ .01	52.0	. . .	71	5	56	42	8	48	16	47	43	78	6 86	.....	13	10,128	se.	56	s.	28	9	9	12	5.7	
Red Bluff	332	50	56	29.73	30.08	— .02	56.2	+ 2.3	82	4	64	40	12	49	27	51	47	78	4.22	+ 1.1	10	3,520	se.	24	se.	23	11	6	13	5.8	
Sacramento	69	106	117	30.01	30.09	+ .01	56.6	+ 3.1	76	4	65	41	14	48	27	53	50	81	2.68	+ 0.5	9	4,056	se.	32	se.	29	11	9	10	5.4	
San Francisco	155	161	167	29.94	30.10	+ .02	57.2	+ 0.9	75	4	62	49	17	52	25	54	52	85	3.48	+ 0.8	10	4,587	se.	29	se.	28	2	11	17	7.4	
Point Reyes Light	.....	12	16	.....	.....	.....	55.2	+ 1.4	70	4	60	44	11	50	22	....	....	....	5.38	+ 2.3	10	6,631	se.	50	nw.	10	9	11	10	5.8	
S. Pac. Coast Reg.							59.6	+ 2.1										78	0.83	— 0.5									3.3	
Fresno	330	67	70	29.73	30.08	+ .02	58.6	+ 3.2	81	5	69	41	20	48	30	52	47	71	0.86	— 0.3	5	2,340	nw.	17	se.	10	14	11	5	4.3	
Los Angeles	338	74	82	29.69	30.05	+ .04	60.6	+ 1.4	85	4	73	43	19	49	32	53	50	81	0.46	— 0.9	1	2,403	w.	14	w.	10	7	21	2	4.2	
San Diego	87	94	102	29.95	30.05	+ .03	60.8	+ 2.2	80	4	68	49	24	54	24	56	54	83	0.41	— 0.4	2	3,288	nw.	21	nw.	3	24	4	2	2.1	
San Luis Obispo	201	10	46	29.89	30.11	+ .07	58.6	+ 1.6	87	4	70	40	19	48	36	52	48	77	1.58	— 0.4	5	2,852	n.	16	s.	9	13	9	8	4.5	
West Indies.																														
Basseterre	29	41	54	29.91	29.94	.....	79.6	.....	87	17	84	69	2	75	13	75	73	80	16.80	.....	19	5,944	e.	34	sw.	2	12	12	6	4.8	
Bridgetown	30	57	65	29.88	29.91	.....	80.8	.....	88	5	86	71	28	75	15	76	73	77	2.32	— 3.9	15	6,251	e.	34	e.	7	7	16	7	5.4	
Cienfuegos	52	62	67	29.98	30.03	.....	71.8	.....	87	6	81	53	18	62	26	64	62	80	T.	.....	0	5,364	ne.	24	ne.	29	21	8	1	2.5	
Grand Turk	11	6	20	.....	.....	.....	76.6	.....	90	6	83	66	18	70	17	....	....	....	5.19	.....	16	.....	ne.	....	.....	.....	4	9	17	6.8	
Havana	57	87	105	30.01	30.07	.....	71.6	.....	82	23	77	58	18	66	19	68	66	86	0.93	— 2.1	9	7,398	ne.	33	e.	29	10	16	4	4.2	
Kingston	286	38	52	29.62	29.92	.....	77.6	.....	88	7	85	66	18	70	19	71	69	79	0.87	.....	8	3,623	n.	18	n.	16	8	17	5	5.5	
Port of Spain	40	65	66	29.85	29.89	.....	80.3	.....	91	15	87	69	26	73	18	74	72	78	7.89	. .....	17	2,723	e.	17	e.	21	7	8	15	6.7	
Puerto Principe	352	55	62	29.67	30.02	.....	72.1	.....	87	23	81	52	18	64	25	66	65	86	0.36	.....	6	5,299	ne.	29	e.	11	12	11	7	4.8	
Roseau	25	37	47	29.89	29.91	.....	80.2	.....	90	6	87	70	19	74	16	73	71	76	5.36	.....	21	3,495	e.	37	sw.	2	10	13	7	5.3	
San Juan	82	48	90	29.86	29.94	.....	78.4	.....	89	16	84	70	26	73	17	74	72	83	9.55	+ 3.0	17	6,171	e.	36	e.	19	8	5	17	6.5	
Santiago de Cuba	82	46	52	29.88	29.96	.....	75.9	.....	87	13	83	61	18	69	19	69	67	81	0.49	.....	5	6,034	n.	22	ne.	29	9	14	7	5.1	
Santo Domingo	57	37	44	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Willemstad	75	39	46	29.79	29.86	.....	80.0	. .....	87	17	85	70	7	76	14	76	74	82	7.26	.....	20	4,951	e.	21	e.	7	5	17	8	5.9	

NOTE.—The data at stations having no departures are not used in computing the district averages. * More than one date. † Station destroyed by fire.

TABLE II.—*Climatological record of voluntary and other cooperating observers, November, 1901.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Ashville	74	16	45.2	1.63	
Benton	.....	.....	.....	2.67	
Bermuda	84[d]	23[b]	52.8[c]	1.60	
Birmingham	81	24	49.8	1.72	
Bridgeport	.....	.....	.....	1.46	
Burkville	.....	.....	.....	2.42	
Calera	.....	.....	.....	1.79	
Camp Hill	81	21	50.2	1.25	
Citronelle	82	31	55.8	1.54	
Clanton	76	24	47.7	2.26	
Cordova	.....	.....	.....	0.17	
Daphne [1]	77	28	54.4	2.15	
Decatur	77	18	46.1	1.88	
Demopolis	.....	.....	.....	2.87	
Elba	80	22	49.4	3.65	
Eufaula *a*	81	23	49.5	1.11	
Eutaw	84	24	49.8	2.90	
Evergreen	82	24	52.8	0.50	
Flomaton	80	24	51.9	1.30	
Florence *a*	.....	.....	.....	1.65	
Florence *b*	82	19	46.8	1.16	
Fort Deposit	80	29	50.8	2.20	
Gadsden	82	19	47.1	2.06	
Goodwater	78	22	48.3	1.84	
Greensboro	78	26	49.2	2.59	
Greenville	.....	.....	.....	2.31	
Hamilton	80	17	46.4	2.12	
Highland Home	82	29	52.8	1.53	
Letohatchee	.....	.....	.....	2.56	
Livingston *a*	81	.....	.....	1.47	
Lock No. 4	78	19	46.7	1.10	
Madison	80	18	47.6	2.20	
Maplegrove	79	18	45.2	1.77	
Marion	81	28	53.2	2.75	
Newbern	80	24	49.8	2.35	
Notasulga	.....	.....	.....	1.64	
Oneonto	77	17	44.8	2.02	
Opelika	76	27	49.2	1.25	
Oxanna	79	18	48.2	1.44	
Prattville	81	21	49.0	.....	
Pushmataha	78	24	49.7	2.13	
Riverton	79	18	45.2	1.70	
Scottsboro	75	16	42.7	2.61	
Selma	81	25	50.2	2.17	
Talladega	80	18[e]	47.8	1.32	
Tallassee	.....	.....	.....	1.87	
Thomasville	81	29	52.6	0.94	
Tuscaloosa	80	23	47.4	2.30	
Tuskegee	84	25	51.9	1.42	
Union Springs	78	28	49.6	2.50	
Uniontown	81	26	51.0	5.14	
Valleyhead	78	18	43.8	2.40	
Verbena	.....	.....	.....	2.20	
Wetumpka	83	26	51.0	1.44	
Alaska.					
Juneau	44	20	34.2	3.52	8.5
Killisnoo	42	23	34.9	3.55	8.5
Sitka	52	26	38.0	6.16	
Arizona.					
Allaire Ranch	.....	.....	.....	0.45	
Arizona Canal Co. Dam.	85	44	65.2	0 47	
Aztec [*1]	93	45	71.7	0.00	
Benson [*1]	70	42	56.6	0.25	
Bisbee	72	37	54.0	0.59	
Bowie [*1]	74	38	56.4	0.30	
Buckeye	83	37	59.7	0.00	
Casagrande [*1]	88	47	68.0	0.00	
Champie Camp	89	38	62.0	0.50	
Cochise [*5]	70	39	53.4	0.72	
Congress	79	47	63.8	0.12	
Dragoon [*1]	70	40	52.0	0.90	
Dudleyville	87	35	59.0	0.09	
Duncan	79	25	51.1	0.50	
Fort Apache	76	17	48.8	0.65	
Fort Defiance	63	14	39.4	0.40	
Fort Grant	92	33	63.4	0.52	
Fort Huachuca	76	36	56.4	1.10	
Fort Mohave	87	36	61.5	0.00	
Gilabend [*1]	90	47	65.2	0.00	
Globe	78	33	55.8	0.32	
Ingleside	86	40	62.0	0.00	
Jerome	70	40	55.1	0.70	
Kingman	79	36	58.6	0.00	
Maricopa [*1]	82	53	65.4	0.00	
Mesa	86[e]	39	62.3	0.34	
Mohawk Summit [*1]	86	50	66.3	0.00	
Mount Huachuca	74	36	55.6	1.32	
Natural Bridge	.....	.....	.....	0.66	
Nogales	81	32	56.8	0.21	
Oracle	72	39	56.6	0.28	
Oro	.....	.....	.....	0.80	
Parker	91	35	63.4	0.00	
Phoenix	85	38	60.8	0.13	
Pima	80	30	54 6	T.	
Pinal Ranch	.....	.....	.....	0.15	
Prescott	72	21	46.2	1.40	
St. Johns	72	19	45.5	0.00	
San Carlos	80	28	53.3	0.20	
Sentinel [*1]	94	48	69.3	0.00	
Showlow	.....	.....	.....	0.36	
Signal	94	29	60.2	0.00	
Silverking	.....	.....	.....	0.10	
Strawberry	68	22	44.8	0.95	
Superstition	.....	.....	.....	0.24	
Taylor	80	20	43.3	0.05	
Tombstone	75	40	56.6	0.77	
Tonto	79	32	54.8	0.42	
Tuba [f]	66	26	45.4	T.	
Tucson	85	36	61.4	0.08	
Vail [*5]	82	50	65.4	0.05	
Walnut Grove	.....	.....	.....	0.10	
Willcox [*1]	68	35	47.1	0.20	
Yarnell	.....	.....	.....	0.48	
Arkansas.					
Amity	81	25	47.6	4.34	
Arkansas City	.....	.....	.....	1.95	
Batesville	84	25	50.2	2.18	
Beebranch	82[e]	22[e]	52.3[e]	3.00	
Blanchard	78	23	51.5	4.10	
Brinkley	80	24	49.8	1.58	
Camden *a*	.....	.....	.....	3.10	
Camden *b*	88	28	52.0	3.11	
Conway	79	25	52.0	3.46	
Dallas	79	26	52.2	2.51	
Dardanelle	.....	.....	.....	2.62	
Elon	84	20	51.7	3.29	
Fayetteville	78	19	49.9	3.34	
Fulton	.....	.....	.....	2.99	
Hardy	75	24	47.8	2.05	
Helena *a*	.....	.....	.....	2.63	
Helena *b*	80	27	51.7	2.49	
Hot Springs *b*	.....	.....	.....	3.86	
Ione	.....	.....	.....	3.21	
Keesees Ferry	79	22	50.0	2.30	
Lacrosse	77	24	47.1	2.63	
Lonoke	80	23	50.3	3.01	
Lutherville	79	24	49.2	2.96	
Malvern	83	25	52.2	3.45	
Marianna	76	23	48.5	2.32	
Marvell	80	25	50.6	2.86	
Mossville	70	25	49.1	4.83	
Mount Nebo	72	28	50.0	2.42	
New Gascony	87	24	50.9	3.68	
Newport *a*	.....	.....	.....	2.79	
Newport *b*	83	24	48.7	3.64	
Newport *c*	83	24	49.3	2.89	
Oregon	79	21	48.3	3.35	
Osceola	77	20	48.1	2.03	
Ozark	79	25	52.0	2.90	
Pinebluff	82	24	49.4	3.29	
Pocahontas	79	19	47.8	2.24	
Pond	77	15	49.0	3.65	
Prescott	82	24	55.6	3.47	
Rison	84	20	52.2	3.04	
Rosadale	87	24	53.4	2.42	
Russellville	87	25	50.8	2.54	
Silversprings	78	19	50.0	3.04	
Spielerville	79	27	51.6	3.52	
Stuttgart	79	25	50.1	2.98	
Texarkana	81	25	53.5	2.79	
Warren	81	20	51.2	3.21	
Washington	76	26	52.4	2.69	
Wiggs	80	20	50.6	3.92	
Winchester	84	23	49.9	2.91	
Winslow	71	21	49.2	4.08	
Witts Springs	76	24	51.2	3.40	
California.					
Ballast Point L. H.	.....	.....	...	0.41	
Bear Valley	...	.....	.....	6.78	3.0
Berkeley	74	46	56.8	3.16	
Bishop	83	23	50.0	0.61	
Bodie	58	5	33.7	1.39	14.0
Bowman	70	30	45.4	7.54	2.0
Branscomb	.....	.....	....	11.91	
Caliente [*1]	87	32	51.0	0.00	
Campbell	79	37	56.0	1.45	
Cape Mendocino L. H.	.....	.....	.....	4.60	
Cedarville	64	18	42.6	0.74	
Chico [*1]	86	42	58.9	3.47	
Claremont	80	38	57.4	0.69	
Corning [*1]	78	40	57.2	4.03	
Crescent City	65	35	50.8	8.10	
Crescent City L. H.	.....	.....	.....	9.28	
Cuyamaca	64	23	45.6	1.48	
Delano [*1]	80	43	60.7	0.26	
Delta [*1]	82	42	54.2	11.27	
Dunnigan [*1]	78	40	56.9	4.54	
Durham [*5]	79	41	56.8	4.14	
East Brother L. H.	.....	.....	.....	4.30	
Edmanton [*1]	67	32	44.0	8.85	
Elcajon	92	35	60.6	0.28	
Elmdale	83	35	55.5	1.85	
Elsinore	90	35	59.7	0.35	
Escondido	85	32	57.0	0.43	
Fallbrook	84	36	56.8	0.75	
Folsom City [*1]	76	41	56.5	3.71	
Fordyce Dam	.....	.....	.....	6.67	15.5
Fort Ross	70	42	56.2	9.89	
Georgetown	74	34	52.6	4.72	
Gilroy (near)	91	35	58.0	1.86	
Glendora	.....	.....	...	0.76	
Grass Valley	...	.....	.....	5.69	
Greenville	70	22	44.8	4.26	
Healdsburg	86	31	54.6	7.78	
Hollister	85	34	56.0	1.18	
Humboldt L. H.	...	.....	.....	4.70	
Idylwild	.....	...	.....	0.69	
Indio [*1]	85	48	65.1	0.00	
Iowa Hill [*1]	75	41	58.2	4.72	
Jackson	69	33	51.6	3.64	
Jolon	.....	.....	.....	1.69	
Kennedy Gold Mine	70	34	50.6	3.40	
Kernville	.....	...	.....	0.15	
King City	78	38	52.4	1.36	
Kono Tayee	68	44	53.6	3.87	
Laguna Valley	.....	.....	.....	0.54	
Lamesa	.....	.....	.....	0.58	
Laporte [*1]	68	29	41.9	9.10	4.0
Las Fuentes Ranch	.....	.....	.....	1.02	
Legrand	.....	35	.....	1.33	
Lemoncove	85	38	60.7	1.15	
Lemoore *a* [*1]	75	46	63.6	1.99	
Lick Observatory	73	38	50.4	2.89	
Lime Point L. H.	.....	.....	.....	3.78	
Los Gatos *b*	75	42	55.6	3.34	
Mammoth [*1]	85	49	66.8	0.00	
Manzana	79	35	56.0	0.30	
Mare Island L. H.	.....	.....	.....	3.07	
Merced	82	37	56.2	2.09	
Mills College	.....	.....	.....	3.00	
Milo	.....	.....	.....	1.47	
Milton (near)	75	43	57.2	2.74	
Modesto [*1]	87	45	60.9	1.62	
Mohave [*1]	70	40	55.4	0.07	
Mokelumne Hill [*5]	.....	43	52.5	3.76	
Monterio	82	40	59.2	0.45	
Monterey [*5]	72	40	57.3	1.58	
Mountainview	.....	.....	.....	1.07	
Mount St. Helena	....	.....	.....	10.39	
Mutah	...	.....	.....	0.65	
Napa	84	41	58.2	3.88	
Needles	80	47	64.7	0.00	
Nevada City	69	33	49.1	5.45	
Newhall [*5]	85	38	55.7	0.70	
Niles	80	40	56 5	1.78	
North Bloomfield	76	31	50.2	4.68	
North Ontario	76	42	58.0	0.75	
North San Juan [*1]	72	35	53.4	6.82	
Oakland	73	44	56.8	3.15	
Oleta [*1]	71	38	50.9	3.53	
Orland [*1]	80	39	57.5	3.51	
Palermo	80	35	55.6	3.39	
Paso Robles	83	32	54.6	1.04	
Peachland [*5]	77	39	56.8	6.64	
Piedras Blancas L. H.	.....	.....	. ....	1.80	
Pigeon Point L. H.	.....	.....	.....	1.18	
Pilot Creek	.....	... .	.....	5.68	1.5
Pine Crest	84	45	60.7	1.75	
Point Ano Nuevo L. H.	.....	.....	.....	2.09	
Point Arena L. H.	.....	.....	.....	5.39	
Point Bonita L. H.	.....	.....	.....	5.94	
Point Conception L. H.	.....	.....	.....	0.34	
Point Fermin L. H.	.....	.....	.....	0.20	
Point Hueneme L. H.	.....	.....	.....	0.50	
Point Lobos	68	48	55.7	3.78	
Point Loma L. H.	.....	.....	.....	0.26	
Point Montara L. H.	.....	.....	.....	2.74	
Point Pinos L. H.	.....	.....	.....	1.81	
Point Sur L. H.	.....	.....	.....	2.81	
Pomona (near)	84	37	59.0	0.67	
Quincy	58	24	44.0	5.19	
Redding	83	39	55.6	6.45	
Redlands	84	41	59.8	0.09	
Reedley	81	37	59.0	1.08	
Represa	70	40	55.4	3.77	
Riovista	.....	.....	.....	2.26	
Riverside	85	35	58.2	0.12	
Roe Island L. H.	.....	.....	.....	1.92	
Rohnerville	.....	.....	.....	4.25	
Rosewood	86	33	53.3	4.28	
Sacramento	70	38	55.3	2.96	
Salinas [*1]	72	45	60.8	1.27	
Salton [*1]	99	45	69.5	0.00	
San Bernardino	89	32	59.0	0.28	
San Jacinto	84	35	58.0	0.06	
San Jose	84	39	59.0	1.06	
San Leandro	78	40	56.0	2.69	
San Luis L. H.	.....	.....	.....	1.23	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
San Mateo *[b]	77	46	57.5	2.08	
San Miguel *[1]	80	35	54.8	0.34	
San Miguel Island	84	47	58.0	1.85	
Santa Barbara	84	46	59.2	1.16	
Santa Barbara L. H	.....	.....	.....	0.78	
Santa Clara	.....	.....	.....	1.16	
Santa Cruz	86	36	54.9	3.28	
Santa Cruz L. H	.....	.....	.....	3.04	
Santa Maria	83	40	58.3	0.56	
Santa Monica	.....	.....	.....	0.70	
Santa Paula	88°	42°	61.9°	0.54	
Santa Rosa *[1]	82	42	60.4	4.22	
Shasta	86	40	55.4	8.79	
Sierra Madre	78	44	60.0	0.86	
Snedden	.....	.....	.....	0.75	
Sonoma	.....	.....	.....	4.44	
Stockton	73	36	54.2	2.14	
Summerdale	71	27	48.0	3.51	6.0
Susanville	63	31	44.8	1.72	
Tehama *[1]	78	42	60.6	3.93	
Tejon Ranch	82	41	59.9	0.17	
Trinidad L. H	.....	.....	.....	3.42	
Truckee *[1]	68	28	40.6	3.63	14.0
Tulare *b*	.....	.....	.....	0.36	
Tulare *c*	86	32	58.6	0.36	
Ukiah	78	30	52.4	5.87	
Upperlake	84	32	53.4	4.35	
Upper Matole *[1]	76	31	50.7	12.85	
Vacaville *[1]	80	42	57.3	3.72	
Visalia	83	33	56.2	0.72	
Volcano Springs *[1]	92	47	64.8	0.00	
Westpoint	.....	.....	.....	4.36	
West Satlcoy	.....	.....	.....	1.00	
Wheatland	70	38	54.0	3.19	
Williams *[b]	80	44	60.4	3.19	
Wilmington *[1]	79	40	56.4	0.25	
Wire Bridge *[b]	75	37	55.4	5.34	
Yerba Buena L. H	.....	.....	.....	2.90	
Yreka	62	25	45.0	1.81	
Yuba City *[b]	76	40	58.0	3.18	
Zenia	.....	.....	.....	8.70	
Colorado.					
Arkins	.....	.....	.....	0.14	1.0
Ashcroft	.....	.....	.....	0.88	12.3
Blaine	79	16	45.6	0.04	
Boulder	72	23	47.8	T.	T.
Boxelder	.....	.....	.....	0.13	0.8
Breckenridge	53	— 3	24.6	0.90	12.2
Buenavista	.....	.....	.....	0.00	
Canyon	73	18	45.6	0.00	
Castlerock	70	12	41.1	T.	
Cedaredge	73	19	42.3	0.35	
Cheyenne Wells	76	16	43.5	0.02	T.
Colibran	65	13	38.8	0.35	T.
Colorado Springs	67	18	42.4	0.01	T.
Delta	71	13	40.2	0.15	T.
Durango	67	17	41.8	T.	
Fort Collins	70	12	40.4	0.02	
Fox	.....	.....	.....	0.00	
Gilman	.....	.....	.....	0.98	17.0
Gleneyrie	67	22	42.4	0.04	0.2
Glenwood	.....	.....	.....	0.58	T.
Greeley	72	13	41.1	0.05	T.
Grover	.....	.....	.....	T.	
Gunnison	65	0	31.3	0.15	2.2
Hamps	71	12	40.2	T.	
Hoehne	73	14	45.0	0.58	T.
Holly	82	17	44.8	0.00	
Holyoke (near)	88	10	43.4	0.00	
Hugo	.....	.....	.....	0.00	
Husted	68	11	38.1	0.00	
Lake Moraine	52	9	33.2	0.55	8.2
Lamar	81	17	46.3	0.00	
Laporte	.....	.....	.....	0.01	
Las Animas	80	12	44.0	0.10	
Lay	64	3	33.8	0.36	3.5
Leadville (near)	.....	.....	.....	1.13	17.0
Leroy	78	15	43.2	T.	
Longs Peak	59	6	34.6	0.18	3.0
Marshall Pass	.....	.....	.....	0.47	8.0
Meeker	65	9	37.0	0.28	
Mitchell	.....	.....	.....	0.45	11.0
Montrose	.....	.....	.....	0.07	
Moraine	61	— 3	33.2	0.27	4.1
Pagoda	69	7	37.2	0.60	6.0
Parachute	66	11	41.2	0.38	T.
Perrypark	.....	.....	.....	0.00	
Rangely	68	9	35.5	T.	
Rockyford	76	15	44.0	0.00	
Rogers Mesa	70	18	41.0	0.20	
Ruby	.....	.....	.....	1.60	24.0
Russell	58	5	33.4	0.00	
Saguache	67	13	37.4	0.00	
Salida	68	8	40.2	0.00	
San Luis	65	8	37.9	0.04	T.
Santa Clara	65	12	42.8	0.12	1.5
Colorado—Cont'd.	°	°	°	*Ins.*	*Ins.*
Sapinero	.....	.....	.....	0.12	2.5
Selbert	.....	.....	.....	0.00	
Silt	67	20	40.7	0.53	T.
Sugarloaf	68	15	38.5	0.12	1.0
Telluride	55	10	34.3	1.25	5.8
Trinidad	72	20	46.9	0.26	
T. S. Ranch	.....	.....	.....	0.10	
Twinlakes	.....	.....	.....	0.14	2.8
Vilas	.....	.....	.....	0.00	
Wagon Wheel	61	0	31.2	T.	T.
Walden	57	6	32.0	0.52	4.4
Wallet	.....	.....	.....	0.00	
Westcliffe	62	11	37.8	0.12	T.
Whitepine	.....	.....	.....	0.25	2.7
Wray	81	14	43.6	T.	
Yuma	.....	.....	.....	T.	
Connecticut.					
Bridgeport	61	12	37.7	1.97	0.5
Canton	59	7	33.1	2.27	T.
Colchester	63	9	36.3	2.71	T.
Falls Village	.....	.....	.....	2.42	3.0
Hartford *b*	60	10	35.2	2.45	0.5
Hawleyville	69	10	35.0	1.83	2.2
Lake Konomoc	.....	.....	.....	2.66	.....
Middletown	61	10	35.6	2.64	1.0
New London	58	13	37.0	2.88	T.
North Grosvenor Dale	65	4	33.6	2.49	T.
Norwalk	62	7	35.4	1.55	0.3
Southington	60	11	35.2	2.25	0.8
South Manchester	.....	.....	.....	2.64	2.0
Storrs	59	8	33.9	3.04	0.5
Voluntown	64	2	33.9	2.99	2.0
Wallingford	.....	.....	.....	2.38	T.
Waterbury	59	10	35.2	2.37	T.
West Cornwall	59	5	32.2	3.26	6.0
West Simsbury	.....	.....	.....	2.24	2.0
Winsted	58	8	31.8	.....	.....
Delaware.					
Milford	76	19	41.7	2.44	0.5
Millsboro	72	17	40.4	2.18	1.0
Newark	62	19	38.9	2.37	2.0
Seaford	70	20	41.6	1.81	1.2
District of Columbia.					
Distributing Reservoir *[b]	65	22	40.7	2.18	.....
Receiving Reservoir *[b]	60	20	40.2	2.54	.....
West Washington	70	19	39.2	2.48	0.5
Florida.					
Archer	81	25	55.7	0.55	
Bartow	84	32	62.4	1.80	
Bonifay	85	26	53.6	0.50	
Brooksville	82	33	57.7	0.66	
Clermont	82	39	61.6	0.50	
De Funiak Springs	85	23	54.0	0.73	
Deland	81	27	58.3	.....	
Earnestville	88	38	62.2	1.80	
Eustis	82	36	61.5	0.89	
Federal Point	79	31	57.0	2.09	
Fernandino	79	36	57.6	0.83	
Fort Meade	90	26	61.6	0.60	
Fort Pierce	84	35	62.8	0.66	
Gainesville	80	30	57.3	0.27	
Huntington	81°	30	58.2°	1.80	
Hypoluxo	90	41	68.6	0.79	
Inverness	82	26	56.1	1.26	
Jasper	79	27	54.8	0.55	
Kissimmee	86	33	61.9	0.67	
Lake Butler	82	25[e]	55.8[d]	0.60	
Lake City	82	27	55.2	0.46	
McAlpin	.....	.....	.....	1.40	
Maccienny	83	24	55.0	0.66	
Manatee	87	31	62.7	0.39	
Marco	85	46	67.4	0.39	
Marianna	80	25	52.6	1.28	
Merritt Island	81	42	63.8	0.63	
Middleburg	82	23	53.2	0.85	
Myers	83	38	63.1	0.52	
New Smyrna	85	33	61.2	2.18	
Nocatee	87	29	62.1	0.19	
Ocala	85	27	58.4	1.18	
Orange City	82	28	59.0	2.13	
Orlando	79	36	61.3	0.54	
Plant City	89°	28[f]	60.4[d]	0.30	
Quincy	84	24	54.8	0.58	
St. Andrews	84	25	54.5	1.50	
St. Augustine	79	36	61.7	0 24	
Stephensville *[1]	85°	30°	57.2°	0.72	
Sumner	85	22	55.4	1.08	
Switzerland	82	30	56.8	0.73	
Tallahassee	80	33	55.1	1.09	
Tarpon Springs	87	32	60.6	1.54	
Titusville	83	34	61.2	2.22	
Waukeenah	81	27	54.2	1.00	
Wausau	84	21	53.2	1.31	
Wewahitchka	83	24	53.0	0.74	
Georgia.					
Adairsville	75	20	46.0	1.93	T.
Georgia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Albany	80	30	55.8	1.48	
Allapaha	83	24	52.8	0.62	
Allentown	84	22	52.0	1.03	
Alpharetta	78	18	45.6	1.31	2.0
Americus	78	25	49.8	1.10	
Athens *b*	70	25	46.9°	0.77	
Bainbridge	79	25	51.1	0.55	
Blakely	79	...	.....	1.25	
Bowersville	79	21	45.6	0.48	2.0
Brent	80	25	49.5	0.46	
Camak	78	26	48.7	0.35	
Canton	.....	.....	.....	1.40	
Carlton	.....	.....	.....	0.63	1.0
Clayton	73	18	43.1	1.05	2.0
Columbus [g]	74	27	48.0	2.58	
Covington	82	22	°48.5	0.50	T.
Dahlonega	78	22	46.4	1.02	2.0
Diamond	73	17	43.1	2.00	1.0
Dublin	.....	.....	.....	1.48	
Elberton	78	23	49.6	0.74	3.0
Experiment	77	24	48.7	0.58	
Fitzgerald	87	22	52.8	0.47	
Fleming	.....	18	.....	1.31	
Fort Gaines	78	26	50.8	0.88	
Gainesville	73	23	45.6	0.15	1.5
Gillsville	81	20	47.8	0.10	1.0
Greenbush	80	12°	44.8	1.10	T.
Griffin	77	24	49.4	0.68	
Harrison	81	23	50.6	1.28	
Hawkinsville	77	23	50.6	1.14	
Hephzibah	.....	27	.....	0.90	
Jesup	80	22	52.2	1.19	
Lost Mountain	77	25	47.4	1.73	
Louisville	79	23	49.7	0.93	
Lumpkin	83	27	52.6	0.95	
Marshallville	80	27	51.8	1.06	
Mauzy	87°	22°	54.2°	0.64	
Milledgeville	75	21	48.3	0.80	
Millen	84	21	50.2	1.14	
Morgan	80	23	49.2	1.04	
Naylor	80	23	53.4	0.95	
Newnan	72	24	46.4	1.21	
Oakdale	.....	.....	.....	1.36	
Point Peter	79	18	45.0	0.87	1.5
Poulan	82	21	50.8	0.47	
Quitman	80	23	52.2	1.25	
Ramsey	75	16	44.9	1.78	T.
Resaca	.....	.....	.....	1.49	
Rome	78	18	45.4	1.53	T.
Statesboro	84	24	51.8	1.10	
Talbotton	80	24	50.8	0.82	
Thomasville	84	27	54.4	0.84	
Toccoa	79	24	47.0	0.62	T.
Union Point	79	23	48.6	0.49	
Valona	78[e]	23	55.0[d]	1.22	
Washington	76	26	48.2	0.93	T.
Waverly	84	22	53.7	0.92	
Waycross	79	25	51.9	0.60	
Waynesboro	80	25	50.0	0.42	
Westpoint	78	21	47.9	1.35	
Woodbury	79	18	47.2	0.20	
Idaho.					
Albion	65	17	42.4	0.44	
American Falls	64	11	39.7	0.67	
Blackfoot	66	16	37.6	T.	
Burnside	54	16	33.8	0.25	1.0
Chesterfield	58	5	30.8	0.44	T.
Downey	66	15	40.0	T.	
Forney	66	5	30.8	1.79	8.5
Garnet	71	25	46.8	0.18	
Grangeville	66	12	35.0	0.14	T.
Hailey	60	20	38.7	0.62	
Idaho City *	62	13	41.1	1.03	
Lake	62	14	36.8	0.60	6.0
Lakeview	58	25	39.5	4.77	
Lost River	55	11	33.2	0.11	1.0
Moscow	56	26	41.1	2.94	0.5
Murray	48	25	36.2	5.05	5.0
Oakley	66	19	42.2	0.20	
Ola	61	18	40.9	1.51	
Payette	78	18	46.1	0.70	
Pollock	65	22	43.4	0.69	
Porthill	49	24	36.6	2.57	5.0
Priest River	50	24	38.7	3.67	5.0
Riddle	66	11	40.0	0.15	
St. Maries	65	25	40.8	3.65	2.5
Swan Valley	61	15	40.5	0.77	
Vernon	60	8	36.8	0.52	4.7
Weston	64[a]	17°	40.5[d]	0.15	
Illinois.					
Albion	70	16	40.2	1.72	
Aledo	69	12	37.4	1.06	T.
Alexander	74	9	39.5	0.88	T.
Antioch	70	13	35.0	0.66	T.
Ashton	67	11	34.4	1.33	0.4
Astoria	71	8	37.6	0.82	T.

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Illinois—Cont'd.	°	°	°	*Ins.*	*Ins.*
Aurora *a*	67	13	35.4	1.21	T.
Bloomington	70	14	37.7	1.11	T.
Bushnell	70	13	38.2	1.60	
Cambridge	69	14	35.3	1.50	2.0
Carlinville	75	10	40.5	1.49	
Centralia	81	13	43.9	2.16	
Charleston	71	16	38.0	1.62	
Chemung	66	10	44.2	0.94	T.
Chester				1.34	
Cisne	73	11	41.6	1.31	
Coatsburg	74	12	39.0	1.62	T.
Cobden	76	16	45.8	1.28	
Danville	73	14	36.4	1.27	T.
Decatur	70	13	38.3	1.54	
Dixon	79	4	35.6	1.00	T.
Dwight	71	13	35.4	1.14	T.
Effingham	72	15	39.6	1.80	
Equality	78	14	43.2	1.54	T.
Flora	73	16	40.8	1.82	T.
Friendgrove *5	70	20	41.4	1.97	
Galva	69	12	35.6	1.08	1.0
Grafton				1.68	
Grayville	70	18	42.2	1.55	
Greenville	75	18	42.3	1.25	
Griggsville	75	17	41.4	0.77	
Halfway	75	17	43.8	1.30	
Halliday	76	10	44.6	1.23	
Havana	74	12	38.7	0.50	T.
Henry	70	11	36.6	1.50	T.
Hillsboro	75	14	40 0	1.72	
Joliet	66	16	35.7	1.63	T.
Kishwaukee [1]	67	12	36.8	1.03	1.5
Knoxville	69	7	34.8	1.15	T.
Lagrange	66	15	36.0	1.04	T.
Laharpe	70	7	37.6	1.08	
Lanark	68	6	33.6	1.06	T.
La Salle	67	14	36.6	1.34	0.5
Loami				1.05	T.
McLeansboro	72	14	42.5	1.36	
Martinton	70	15	36.8	1.10	
Mascoutah	74	11	40.4	1.44	
Mattoon	76	22	42.4	2.14	
Melrose	72	16	39.3	1.10	
Minonk	71	11	36.4	0.78	T.
Monmouth	69	7	35.8	0.87	T.
Monticello	65[k]	13	36.0[e]	1.30	T
Morgan Park				1.42	0.2
Morrison	65	8	34.5	1.03	T.
Morrisonville	74	15	39.4	1.78	
Mount Carmel				1.74	
Mount Pulaski	71	15	39.2	1.07	T.
Mount Vernon	73	14	43.2	1.79	
New Burnside	74	15	44.2	1.70	
Olney	72	14	40.8	1.27	
Ottawa	70	17	37.6	1.49	T.
Palestine	63	16	37.6	2.00	
Pana	75	17	40.0	1.70	
Paris	72	19	39.0	2.19	
Peoria *a*				1.08	
Peoria *b*	71	15	38.5	0.80	
Philo	70	14	37.0	1.36	T.
Plumhill	75	12	42.6	2.11	
Rantoul	71	14	40.9	1.63	T.
Raum	71	20	44.0	1.94	
Riley	66	13	34.4	1.05	T.
Robinson	72	16	40.3	1.70	
Rushville	72	14	40.1	1.07	
St. Charles *5	62	14	33.6	1.54	T.
St. John	74	10	43.0	1.03	
Scales Mound	66	[y]	33.6	0.81	1.5
Shobonier	75	11	40.4	1.44	
Strawn	69	11	35.8	1.00	
Streator	71	6	36.0	1.38	
Sullivan	74	12	39.2	1.78	
Sycamore	65	13	34.0	1.32	T.
Tilden	73	12	43.0	2.40	T.
Tiskilwa	68	14	35.8	1.54	3.0
Tuscola	70	15	37.3	1.82	T.
Walnut	69	13	36.5	1.37	0.3
Wellington	70	19	37.5	1.06	
Winchester	73	12	40.4	1.29	
Winnebago	67	11	34.0	1.20	2.0
Yorkville	70	11	36.1	0.99	
Zion	67	11	33.8	0.55	T.
Indiana.					
Anderson	69	20	39.0	1.30	T.
Angola	59	19	36.0	1.81	0.8
Auburn	62[l]	16[l]	36.2[l]	1.15	1.4
Bloomington	76	20[c]	42.2[c]	0.95	T.
Bluffton	68	17	37.5	1.50	1.0
Bright	70	20	39.6	1.22	
Butlerville	75	17	39.5	1.43	T.
Cambridge City	69	16	35.8	1.02	0.1
Columbus	72	15	39.2	1.02	
Connersville	71	18	38.0	0.90	T.
Delphi	69	16	37.0	1.52	T.
Edwardsville *1	70	21	42.2	1.45	
Farmland	72	17	37.4	0.84	1.0
Franklin *1	71	21	38.9	0.91	T.
Greencastle	66	21	38.7	1.09	T.
Hammond	66	11	35.6	2.23	
Huntington	68	21	38.2	1.35	2.0
Jeffersonville	71	20	41.3	1.18	T.
Knightstown	69	18	39.1	1.10	T.
Kokomo	63	20	39.2	1.08	T.
Lafayette	69	18	39.2	1.28	T.
Laporte	69	19	38.6	1.55	0.5
Logansport	63	19	37.0	1.23	0.5
Madison *a*	70	17	39.5	1.42	T.
Madison *b*				2.10	
Marengo	73	16	40.1	1.49	
Marion	65	18	38.4	1.19	0.4
Markle	68	17	37.2	1.70	2.0
Mauzy	71	15	37.8	1.14	T.
Mount Vernon	77	16	42.6	1.78	
Northfield	68	18	37.0	0.87	T.
Paoli	72	15	40.4	1.22	T.
Prairie Creek	74	16	40.0	1.58	
Princeton	73	14	39.8	1.65	
Rensselaer	69	16	37.5	1.29	T.
Richmond	70	12	37.5	0.76	T.
Rockville	70	16	38.8	1.30	T.
Salem	73	14	40.4	1.28	T.
Scottsburg	72	18	40.1	1.36	
Seymour	72	18	38.8	1.01	T.
South Bend	65	18	38.0	2.00	1.0
Syracuse	63	18	36.2	1.59	2.5
Terre Haute	70	22	39.7	1.93	
Topeka	67	22	37.3	1.80	T.
Valparaiso	67	17	36.0	0.86	
Veedersburg	70	15	37.8	0.98	
Vevay	73	21	42.2	1.45	T.
Vincennes	72	18	40.0	1.63	
Washington	70	16	40.4	1.89	
Winamac	68	11	36.1	0.85	1.3
Worthington	71	15	38.9	1.34	T.
Indian Territory.					
Ardmore	85	28	55.2	0.38	
Bengal	80	20	50.2	1.35	
Chickasha	81	27	52.2	1.00	
Durant	80	26	55.0	0.71	
Fairland	79	22	51.5	3.02	
Hartshorne	82	22	53.8	2.10	
Healdton	82	23	53.4	0.68	
Holdenville	81	25	53.0	1.63	
Marlow	83	31	53.8	1.54	
Muscogee	79	29	52.0	2.34	
Pauls Valley [d]	81	19	52.5	0.65	
Roff	80[c]	30[c]	54.0[c]	2.15	
Ryan	85	29	56.4	1.17	
South McAlester				2.03	
Tahlequah	81[c]	20[c]	50.8[c]	5.10	
Tulsa				3.60	
Wagoner	77	28	47.6	1.19	
Iowa.					
Afton	66	14	38.4	1.17	4.0
Albia	65	8	37.0	2.02	5.0
Algona	64	11	33.3	1.17	1.0
Alta	67	10	34.0	1.22	0.7
Amana	67	8	35.1	0.93	1.0
Ames	68	11	37.9	0.67	3.0
Atlantic	69	11	36.7	0.72	0.5
Audubon	67	14[d]	36.6	0.25	
Baxter	77	8	35.8	0.43	2.0
Belknap	70	15	43.6	0.93	
Belleplaine	67[c]	6[h]	33.7[c]	1.00	6.0
Bonaparte	70	9	38.2	0.82	
Britt	61	6	32.0	0.81	2.0
Buckingham				0.67	5.0
Burlington	71	13	39.2	0.77	
Bussey				0.55	3.0
Carroll	68	11	37.0	1.14	2.5
Cedar Rapids	69	12	36.2	0.61	0.5
Centerville	69	12	40.6	0.78	
Chariton	67	11	37.8	0.58	4.5
Charles City	63	6	32.4	0.50	3.0
Clarinda	71[d]	14	39.2	1.30	3.5
Clearlake	74	9	37.4	0.65	2.5
Clinton	67	10	33.9	0.82	T.
College Springs	67	13	39.2	1.00	
Columbus Junction	69	12	36.4	0.80	T.
Corning	63	13	37.0	1.50	4.0
Council Bluffs	68	18	40.9	0.88	1.0
Cresco	67	6	31.2	0.50	4.0
Cumberland				1.24	6.0
Danville				0.72	
Decorah	62	2	31.4	1.46	3.0
Delaware	65	7	32.5	0.48	3.5
Denison	66	11	35.0	0.61	1.0
Desoto	65	13	37.3	1.20	2.0
Dows	64	6	33.0	0.58	2.0
Eldon	70	6	37.6	0.75	1.0
Elkader	69	2	34.8	0.87	5.0
Emerson				0.00	
Estherville	66	6	31.2	1.16	1.5
Fayette	62	0	32.2	0.65	5.0
Fonda				1.22	0.8
Forest City	66	5	33.4	0.57	0.5
Fort Dodge	68	8	34.2	0.90	2.0
Fort Madison				0.79	
Galva	68	10	34.6	2.00	
Gilman				0.43	1.8
Glenwood	67	15	39.5	0.60	1.5
Grand Meadow	62	5	32.6	0.70	7.0
Greene	66	7	33.6	0.32	3.0
Greenfield	66	11	37.5	1.39	2.6
Grinnell	65	10	35.1	0.66	5.0
Grinnell (near)	66	6	34.9	1.07	4.0
Grundy Center	67	3	34.0	0.89	3.0
Guthrie Center	68	10	36.8	1.33	2.0
Hampton	61	8	35.0	0.65	1.5
Harlan	63	12	35.7	0.67	1.5
Hopeville	65	13	37.6	0.88	
Humboldt	65	8	33.9	0.57	2.0
Independence	65	5	33.2	0.32	3.2
Indianola	68	12	37.3	0.39	2.0
Iowa City	72	9	35.4	0.79	1.0
Iowa Falls	63	6	32.3	0.49	3.0
Jefferson				1.41	2.5
Keosauqua	70	10	39.2	1.22	0.1
Knoxville	68	12	38.3	0.27	
Lacona				0.70	2.0
Leclaire				1.16	0.5
Lemars	67	10	35.1	0.60	T.
Lenox	67	13	37.7	2.30	1.5
Logan	74	13	36.4	0.94	3.0
Maple Valley				1.17	
Maquoketa	72	8	37.0	0.51	
Marshalltown	67	9	35.6	0.77	3.1
Monticello	65	9	33.8	0.84	3.0
Mountayr	68	13	38.8	1.28	5.0
Mount Pleasant	71	6	35.4	0.72	T.
Mount Vernon *b*	69	10	36.0	0.97	4.7
Murray				0.20	2.0
New Hampton	61	5	31.5	0.68	4.0
Newton	65	8	35.5	0.83	4.0
Northwood	63	7	32.6	0.51	3.0
Odebolt	62	11	35.2	0.88	2.0
Ogden	67	6	35.2	0.87	2.0
Olin	67	9	33.8	1.00	2.0
Onawa	69	13	37.8	1.45	0.5
Osage	58	8	31.9	0.94	4.0
Oskaloosa	68	8	36.6	0.35	2.6
Ottumwa	70	13	38.6	0.68	T.
Ovid	70	9	39.2	0.87	4.0
Pacific Junction	67	11	38.8	0.80	1.5
Pella	70	10	38.4	0.53	3.0
Perry	70	8	37.2	1.00	
Plover	67	9	34.1	1.22	0.8
Redoak	68	17	40.0	0.74	3.0
Ridgeway	64	8	34.4	1.50	6.5
Rockwell City	65	11	35.4	0.73	
Ruthven				1.22	1.5
Sac City	67	8	35.2	1.11	1.5
St. Charles	70	13	39.7	0.55	2.0
Scranton	66	9	36.6	0.82	1.0
Sheldon	70	9	33.5	0.83	0.4
Sibley	69	10	33.6	0.70	0.5
Sigourney	69	10	38.2	0.81	1.0
Sioux Center	67	10	34.7	0.73	0.5
Stockport				0.59	T.
Storm Lake	65	11	34.4	1.18	0.7
Thurman	67	13	37.4	1.60	
Tipton	68	11	36.1	1.00	T.
Toledo	67	5	36.2	0.75	
Villisca	70	12	37.7	0.50	5.0
Vinton *1	66	8	34.2	0.35	3.5
Wapello	69	13	38.7	1.10	
Washington	69[c]	8[f]	34.9[c]	0.77	
Washta				0.90	1.0
Waterloo	67	8	34.3	0.84	3.0
Waverly	63	8	33.5	0.48	3.0
Westbend	66	10	33.4	0.75	1.0
West Union				0.80	8.0
Wilton Junction	67	8	35.8	0.91	T.
Winterset	69[c]	12[h]	37.8[c]	1.11	4.0
Woodburn				0.85	2.2
Kansas.					
Abilene	68	19	45.0	0.91	
Achilles	82	10	42.0	0.31	
Altoona	77	18	47.8	0.91	
Anthony				0.97	
Atchison	74	21	43.6	1.53	1.0
Baker	69	18	40.6	0.50	
Beloit	71	18	43.3	0.13	
Burlington	75	15	45.6	0.76	
Chanute	78	19	48.5	1.32	
Colby	81	10	41.8	0.07	

TABLE II.—*Climatological record of voluntary and other cooperating observers.*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean	Precipitation. Rain and melted snow.	Total depth of snow.
Kansas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Columbus	79	19	47.3	2.27	
Coolidge	79	19	42.8	0.00	
Delphos	73	16	44.3	0.23	
Dresden	80	17	43.3	0.13	
Ellinwood	71	20	44.4	0.24	
Emporia	72	24	46.2	.....	
Englewood	76	20	46.2	0.17	
Eureka	.....	.....	.....	1.20	
Eureka Ranch	80	14	43.8	0.14	
Fallriver	75	19	47.4	1.17	
Farnsworth[*1]	79	26	44.0	T.	
Fort Leavenworth	77	22	44.8	0.90	T.
Fort Scott	78	19	46.8	1.29	
Frankfort	71	14	42.5	1.10	
Garden City	78	17	45.2	0.00	
Gove[*1]	79	25	48.4	T.	
Grenola	75	20	47.4	1.61	
Hanover	66	16	42.2	1.09	T.
Harrison	74	14	42.2	0.07	
Horton	69	18	42.0	0.95	T.
Hoxie	79	17	43.1	0.10	
Hutchinson	74	19	46.4	0.27	
Independence	79	22	48.4	1.49	
Jetmore	77	17	45.6	0.09	
Lakin	77	19	44.4	0.00	
Lawrence	73	24	44.4	1.31	T.
Lebanon	75	16	42.7	T.	
Lebo	75	19	44.9	1.05	
Leoti	79	.....	.....	T.	
Little River	70	19	44.5	T.	
Macksville	71	20	45.0	0.35	
McPherson	69	20	45.2	0.04	
Madison	74	15	45.4	0.79	
Manhattan	75	15	44.7	1.04	
Marion	68	22	46.2	0.80	T.
Medicine Lodge	73	21	48.4	0.34	
Minneapolis	72	18	43.6	0.45	
Moran	76	18	47.2	1.15	
Mounthope[*1]	69	25	46.3	0.53	
Ness City	78	21	46.4	0.39	
Newton	71	21	45.4	0.70	T.
Norwich	73	22	48.0	0.74	
Oberlin	.....	.....	.....	0.25	
Olathe	75	16	44.8	0.97	
Osage City	71	16	43.6	1.16	0.1
Osborne	.....	.....	.....	0.45	
Oswego	78	18	49.0	1.58	
Ottawa	75	15	44.4	1.19	
Phillipsburg	76	20	42.6	0.36	
Pratt	72	16	46.9	0.34	
Rome	79	20	48.1	1.77	
Salina	69	18	45.0	0.35	
Scott	79	13	41.4	0.00	
Sedan	83	20	47.6	1.33	
Seneca	69	16	42.8	0.62	0.2
Toronto	75	20	43.2	1.20	
Ulysses	80°	16°	44.2°	T.	
Valley Falls	78	17	43.8	0.75	1.0
Viroqua	77	20	45.7	T.	
Wakeeney (near)	.....	.....	.....	0.50	
Wallace	.....	.....	.....	T.	
Wamego[*1]	69	18	43.0	1.11	0.2
Winfield	73	21	48.2	1.48	
Yates Center	73	15	43.8	1.02	
Kentucky.					
Alpha	79	20	44.2	1.50	
Anchorage	74	16	39.1	1.46	T.
Bardstown	76	17	42.6	1.55	
Berea	76	17	41.6	1.73	T.
Blandville	72	23	44.2	2.41	
Burnside	76	17	40.2	1.49	
Carrollton	72	18	42.3	0.86	T.
Catlettsburg	72	20	40.4	2.09	T.
Centertown	75	14	42.8	1.33	
Earlington	77	15	44.6	1.90	
Edmonton	80	14	42.2	1.32	
Eubank	75	15	39.1	1.80	
Falmouth	.....	.....	.....	1.46	T.
Fords Ferry	76	11	42.6	2.36	
Frankfort	.....	.....	.....	0.35	
Georgetown	76	20	40.8	.....	
Greensburg	82	15	40.3	1.03	
Henderson	73	21	43.2	1.68	
Hopkinsville	75	14	44.0	1.68	
Irvington	71	14	39.8	1.27	
Leitchfield	72	14	41.0	1.10	
Loretto	78	12	39.6	1.64	
Manchester	75	12	40.9	2.40	T.
Marrowbone	78	13	41.0	1.25	T.
Maysville	78	17	39.6	1.71	T.
Mount Sterling	72	18	38.3	2.12	
Owensboro	74	17	44.6	1.44	
Owenton	.....	20	.....	1.74	
Paducah[a]	.....	.....	.....	2.06	
Paducah[b]	77	20	47.5	2.06	
Pikeville	76	18	41.7	2.37	1.0

Stations.	(Fahrenheit.) Temperature. Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Kentucky—Cont'd.	°	°	°	*Ins.*	*Ins.*
St. John	72	16	40.4	1.12	
Scott	75	18	40.1	1.15	T.
Shelby City	78	14	38.6	1.63	T.
Shelbyville	75	17	39.8	1.50	T.
Warfield[j]	76	18	38.9	1.89	
Williamsburg	71	19	42.4	2.04	
Louisiana.					
Abbeville	80	32	58.6	2.50	
Alexandria	86	28	55.0	2.11	
Amite	84	26	54.4	3.00	
Baton Rouge	84	29	55.6	2.28	
Burnside	84	26	55.8	2.70	
Calhoun	88	25	52.0	2.05	
Cameron	80	34	60.8	0.87	
Cheneyville	86	27	53.2	1.92	
Clinton	83	26	54.4	1.77	
Collinst n	88	24	54.6	2.30	
Covington	88	27	56.6	4.11	
Donaldsonville	86	32	59.6	2.22	
Emilie	79	29	55.2	2.68	
Farmerville	76	32	54.2	1.73	
Franklin	84	32	57.2	4.52	
Grand Coteau	82	30	56.5	1.91	
Hammond	88	26	55.8	2.28	
Houma	83	29	56.7	5.61	
Jeanerette	91	30	57.9	2.75	
Jennings	85	27	57.5	0.79	
Lafayette	84	27	56.3	0.71	
Lake Charles	83	32	58.2	1.85	
Lake Providence	86	28	56.2	2.57	
Lawrence	83°	36[b]	59.0°	2.77	
Libertyhill	84	27	55.5	2.60	
Mansfield	85	26	54.6	2.62	
Melville	82	27	55.0	3.20	
Minden[d]	83	25	54.6	2.80	
Monroe	83	28	55.6	1.98	
New Iberia	81°	32°	57.0°	1.50	
Opelousas	84	27	55.2	1.41	
Oxford	84	26	54.4	1.67	
Paincourtville	81	30	54.5	1.72	
Plain Dealing	82	24	53.3	3.09	
Prevost	.....	.....	.....	2.51	
Rayne	85	27	56.4	0.68	
Reserve	86	30	56.4	3.29	
Robeline	82	25	54.5	1.60	
Ruddock	78	35	56.2	2.47	
Schriever	87	27	56.2	2.98	
Sugar Ex. Station	82	34	56.4	2.62	
Sugartown	80	33	57.4	0.47	
Venice	83	33	59.5	1.97	
Wallace	82	29	57.1	2.88	
White Sulphur Springs	87	26	56.6	2.73	
Maine.					
Bar Harbor	60	8	33.9	3.50	6.5
Belfast	59	2	30.1	3.11	15.0
Bemis	65	7	30.8	3.70	37.0
Calais	69	0	32.0	2.31	9.6
Carmel	65	− 3	29.8	2.40	24.0
Cornish	60	3	30.3	2.00	6.0
Fairfield	60	− 1	29.4	2.19	9.0
Farmington	58	− 4	28.6	2.10	19.0
Flagstaff	72	− 9	25.8	2.20	22.0
Gardiner	62	3	31.3	2.41	10.0
Kineo	52	5	27.2	2.70	27.0
Lewiston	68	8	31.3	2.20	11.2
Mayfield	66	1	29.0	2.24	22.0
North Bridgton	63	3	31.8	2.14	7.0
Orono	58	− 8	28.6	2.54	19.8
Rumford Falls	55	2	23.2	1.76	9.0
Winslow	71	− 3	30.5	1.38	8.5
Maryland.					
Annapolis	66	23	42.8	2.41	T.
Boettcherville	72	15	38.6	2.62	3.0
Boonsboro *a*	65	12	38.6	3.17	0.5
Cambridge	65	27	44.2	1.43	0.2
Charlotte Hall	74	19	39.7	1.53	T.
Chase	65	9	36.2	3.63	0.1
Cheltenham	72	17	40.5	2.63	0.5
Chestertown	68	21	39.6	2.60	1.0
Chewsville	67	.....	.....	2.86	1.0
Clearspring	65	18	38.2	2.59	1.5
Coleman	.....	.....	.....	1.72	1.0
Collegepark	69	14	38.3	2.78	T.
Colora	.....	.....	.....	3.63	2.0
Cumberland *b*	.....	.....	.....	2.12	
Darlington	68	18	39.3	3.29	1.2
Deerpark	66	9	31.8	3.75	31.0
Easton	65	21	41.9	2.42	0.1
Fallston	63	20	39.4	3.26	1.2
Frederick	65	20	41.4	2.71	T.
Grantsville	64	14	32.8	2.56	14.0
Greatfalls	65	17	37.8	2.18	
Greenspring Furnace	65	16	38.1	3.13	1.3
Guard	64	11	34.6	3.12	8.3
Hancock	69	14	38.2	2.69	T.
Harney	.....	.....	.....	2.00	

Stations	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Maryland—Cont'd.	°	°	°	*Ins.*	*Ins.*
Jewell	66	19	41.3	3.17	0.5
Johns Hopkins Hospital	65	20	39.8	2.15	
Laurel	72	14	39.0	3.98	T.
Longwoods	.....	.....	.....	2.73	T.
McDonogh	65	19	37.2	2.43	T.
Mount St. Marys Coll	65	20	39.1	3.05	T.
Newmarket	63	19	39.0	2.68	T.
Pocomoke	73	17	42.6	1.86	T.
Princess Anne	72	17	41.4	1.93	0.2
Queenstown	65	21	40.6	2.56	0.5
Rockhall *b*	65	17	41.0	3.30	0.5
Sharpsburg	67	13	38.6	3.86	1.8
Smithsburg *a*	65	14	38.3	3.23	1.0
Smithsburg *b*	65	17	38.2	4.39	0.5
Solomons	72	25	44.0	1.74	0.2
Sudlersville	67	20	40.6	2.11	0.5
Sunnyside	69	4	30.5	5.20	25.5
Takoma Park	69	19	38.8	2.89	.....
Taneytown	64	18	37.0	2.14	T.
Van Bibber	62	21	40.0	2.74	.....
Westernport	65	16	35.6	1.76	1.0
Woodstock	65	18	40.0	2.83	T.
Massachusetts.					
Amherst	61	6	34.4	1.30	T.
Bedford	65	8	34.1	2.58	1.0
Bluehill (summit)	67	6	34.0	3.18	3.6
Cambridge	65	9	35.6	2.80	T.
Chestnuthill	65	8	35.6	2.83	1.5
Cohasset	.....	.....	.....	2.88	T.
Concord	66	7	32.9	2.10	1.7
Fallriver	65	13	38.4	2.13	2.5
Fitchburg *a*[*1]	62	7	32.3	1.67	3.5
Fitchburg *b*	63	6	33.5	1.49	2.8
Framingham	64	8	35.5	2.72	1.5
Groton	64	8	32.6	1.97	2.5
Hyannis	.....	.....	.....	2.20	0.8
Jefferson	.....	.....	.....	2.32	4.8
Lawrence	65	8	34.4	2.60	4.5
Leominster	.....	.....	.....	1.86	3.6
Lowell *a*	66	8	34.7	2.79	.....
Lowell *b*	66	7	34.0	.....	.....
Ludlow Center	58	0	29.6	1.57	1.0
Middleboro	66	6	34.6	2.23	1.8
Monson	61	3	32.8	2.36	2.6
New Bedford *a*	64	10	38.2	1.69	1.2
Pittsfield	63	5	31.4	2.80	17.5
Plymouth[*1]	66	10	38.4	2.59	2.0
Princeton	.....	.....	.....	2.47	8.0
Provincetown	68	18	39.2	2.41	T.
Salem	.....	.....	.....	2.90	1.5
Somerset[*1]	68	8	36.8	2.50	1.5
Springfield Armory	60	9	34.8	1.37	T
Sterling	.....	.....	.....	2.07	2.2
Webster	.....	.....	.....	2.47	1.5
Westboro	65	10	35.7	3.16	2.5
Weston	64	9	34.8	2.76	2.0
Williamstown	57	9	31.4	2.43	10.1
Winchendon	.....	.....	.....	2.27	6.2
Worcester	62	8	34.8	2.15	2.0
Michigan.					
Adrian	63	13	35.7	1.89	0.5
Agricultural College	59	9	32.8	1.21	1.3
Allegan	59[d]	24[d]	35.6[d]	1.85	1.0
Alma	60	10	34.6	0.95	T.
Ann Arbor	60	12	35.0	1.28	1.0
Annpere	.....	.....	.....	0.45	T.
Arbela	60	8	33.5	0.78	0.5
Baldwin	69	11	35.4	1.10	1.5
Ball Mountain	60	12	34.6	0.74	0.5
Battlecreek	62	15	36.1	1.09	0.3
Bay City	60	9	32.9	0.85	T.
Benzonia	60	21	34.2	2.48	7.9
Berlin	59	13	34.4	1.31	0.7
Berrien Springs	65	22	38.4	1.80	2.5
Big Rapids	58	15	32.0	1.04	T.
Birmingham	57	12	35.8	0.43	T.
Boon	57	9	29.8	1.41	4.4
Calumet	55	12	28.8	1.33	15.0
Carsonville	65	17	33.2	0.43	0.5
Cassopolis	65	22	38.2	1.93	2.8
Charlevoix	61	11	37.8	2.13	0.4
Chatham	56	10	29.1	4.53	45.0
Cheboygan	59	13	33.6	0.65	3.5
Clinton	66	12	36.0	1.42	T.
Coldwater	62	15	36.0	1.82	T.
Deerpark	55	9	32.2	3.57	19.5
Detour	49	10	32.8	1.84	6.0
Dundee[g]	56	12	34.8	1.59	T.
Eagle Harbor	56	18	32.8	0.97	1.0
East Tawas	66	8	35.8	.....	.....
Eloise	66	10	35.6	0.17	T.
Ewen	60	.....	.....	0.79	7.9
Fairview	59	7	34.5	1.00	T.
Fennville	64	22	37.4	1.75	3.0
Fitchburg	58	10	34.2	1.08	2.0
Flint	60	10	34.2	1.16	0.5

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Michigan—Cont'd.	°	°	°	*Ins.*	*Ins.*
Frankfort	55	.....	.....	0.50	3.9
Gaylord	57	2	30.0	2.25	10.0
Gladwin	59	6	33.5	0.65	T.
Grand Rapids	64	22	37.2	1.64	0.5
Grape	64	12	35.8	1.45	0.2
Grayling	57	— 1	31.0	1.07	6.2
Hanover	61	12	35.6	1.78	1.6
Harbor Beach	60	17	35.3	0.89	3.0
Harrison [c]	58	[g]	30.4	0.69	1.0
Harrisville	57	11	32.8	0.88	2.0
Hart	51	16	32.2	1.35	4.5
Hastings	62	14	35.0	1.42	1.7
Hayes	61	16	35.4	0.29	T.
Highland Station	.....	.....	.....	1.51	T.
Hillsdale	59	13	34.8	2.00	0.5
Humboldt	55	— 4	24.0	1.37	9.0
Ionia	61	13	35.6	0.90	T.
Iron Mountain	59	2	29.2	1.16	4.5
Ironwood	62	7	28.0	1.18	3.8
Ishpeming	58	11	28.1	2.20	14.0
Ivan	58	9	30.2	1.86	10.5
Jackson	60	14	36.0	1.01	T.
Jeddo	61	15	34.8	1.16	0.2
Kalamazoo	60	14	37.4	0.31	T.
Lake City	58	12	29.4	0.25	2.0
Lansing	59	12	34.1	1.32	1.0
Lapeer	60	8	34.2	.....	.....
Lathrop	60	10	28.8	4.72	19.0
Lincoln	57	10	33.0	0.10	T.
Ludington	63	18	37.6	0.79	3.8
Mackinac Island	53[f]	10	31.9[6]	1.90	5.0
Mackinaw	68	11	34.2	1.47	5.0
Mancelona	59	9	31.8	2.28	13.0
Manistee	70	22	36.6	1.73	3.7
Manistique	52	15	33.2	2.56	2.5
Menominee	57	13	32.9	1.72	1.0
Midland	60	10	35.0	0.34	1.0
Mio	56	2	30.7	0.92	3.2
Mount Pleasant [h]	50	14	32.6	.....	.....
Muskegon	61	22	36.8	1.41	T.
Newberry	60	18	33.0	0.58	5.6
North Marshall	60	12	34.6	0.47	1.7
Old Mission	60	20	34.4	1.62	7.0
Olivet	58	15	35.0	1.37	3.6
Omer	57	12	35.0	.....	.....
Onaway	57	10	33.1	1.11	2.0
Ontonagon	64	9	30.0	2.14	20.0
Ovid	60	11	35.4	1.34	1.0
Owosso	60	10	35.6	1.10	0.5
Petoskey	55	15	33.5	2.65	9.5
Pontiac	60	11	34.6	0.83	0.5
Port Austin	55	20	34.8	0.68	T.
Reed City	60	16	32.8	0.97	0.5
Roscommon	.....	.....	.....	0.30	1.0
Saginaw	61	10	35.3	1.26	1.2
St. Ignace	62	.....	.....	2.49	6.5
St. Johns	60	17	35.5	1.11	0.5
St. Joseph	65	25	37.7	1.16	0.6
Sidnaw	.....	.....	.....	1.24	12.4
Somerset	59	11	33.7	0.30	T.
South Haven	64	15	37.8	1.16	6.5
Stanton [c]	68	10	32.6	1.36	.....
Thomaston	60	— 2	26.4	0.60	5.0
Thornville	60	13	34.7	1.47	4.5
Traverse City	62	20	35.6	2.04	11.9
Vassar	61	13	33.8	1.15	T.
Wasepi	61	22	36.6	1.80	1.5
Waverly	.....	.....	.....	1.26	1.0
West Branch	58	6	30.0	0.38	T.
Whitecloud	60	15	33.3	0.80	T.
Whitefish Point	49	12	32.6	1.66	9.0
Ypsilanti	61	9	34.7	1.76	1.2
Minnesota.					
Ada	85[j]	4[j]	26.5[j]	.....	.....
Albert Lea	64	8	30.2	0.60	2.0
Alexandria	55	6	29.6	0.08	0.8
Ashby	55	5	28.0	0.53	2.2
Beardsley	62	4	28.6	0.15	1.5
Bemidji	57	2	26.5	0.59	T.
Bird Island	72	8	29.2	0.59	0.4
Blooming Prairie	60	3	30.0	0.45	1.0
Brainerd	52	8	25.9	.....	.....
Caledonia	62	6	30.9	0.75	5.5
Collegeville	55	12	30.1	0.67	2.3
Crookston	50	5	26.6	T.	T.
Currie	75	7	31.2	.....	.....
Deephaven	.....	.....	.....	0.73	1.5
Detroit City	52	0	25.8	0.27	T.
Faribault	61	9	31.4	0.62	0.4
Farmington	60	9	31.8	0.61	3.0
Fergus Falls	55	4	27.6	0.30	2.8
Glencoe	60	2	29.0	0.65	T.
Grand Meadow	60	6	30.2	0.74	6.0
Hallock	48	— 4	23.4	0.11	0.5
Hovland	.....	.....	.....	1.15	7.0
Lake Winnibigoshish	52	3	24.8	0.43	1.3

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Minnesota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Leech	50	2	24.0	0.43	1.0
Long Prairie	58	— 1	27.8	0.68	1.1
Luverne	65	10	31.5	0.94	1.5
Lynd	65	7	31.4	0.89	T.
Mapleplain	59	9	29.6	0.86	3.2
Milan	64	4	28.9	0.40	1.5
Minneapolis *b* [1]	54*	8	29.4	1.20	2.0
Montevideo	68	7	28.9	0.62	2.0
Morris	54	4	26.4	0.70	4.0
Mount Iron	48	1	22.6	1.50	4.5
New London	58	8	28.0	0.85	0.2
New Richland * [1]	64	6	30.6	.....	.....
New Ulm	62	2	30.1	0.85	4.5
Park Rapids	54	3	25.8	0.70	4.8
Pine River	60	5	28.2	1.59	7.0
Pipestone	71	10	30.4	0.57	1.2
Pleasant Mounds	66	8	32.6	1.20	1.5
Pokegama Falls	50	— 8	22.9	1.44	4.5
Redwing *a*	.....	.....	.....	0.62	2.0
Redwing *b*	62	12	32.2	0.50	2.0
Reeds	.....	.....	.....	0.47	1.0
Rolling Green	62	11	31.3	0.72	2.0
St. Charles	61	10	32.5	0.60	3.0
St. Cloud	56	9	29.8	0.50	T.
St. Peter	72	7	33.4	1.70	0.8
Sandy Lake Dam	51	0	25.7	1.28	6.5
Shakopee	59	8	31.2	1.40	1.0
Tower	49	— 8	21.9	0.90	5.0
Two Harbors	49	6	26.3	2.06	2.2
Wabasha * [2]	.....	12	28.8	0.90	2.0
Warroad	54	—10	22.4	0.50	5.0
Willmar	57	8	28.6	0.65	1.0
Willow River	55	4	27.9	0.95	4.5
Winnebago City	64	9	30.0	1.05	1.0
Worthington	65	10	32.5	0.52	0.5
Zumbrota [1]	60*	7	30.2	.....	.....
Mississippi.					
Aberdeen	79	22	47.6	2.30	
Agricultural College	80	29	51.8	4.00	
Austin	79	23	49.3	3.31	
Batesville	79	22	46.7	2.58	
Bay St. Louis	77	31	55.3	2.79	
Biloxi	81	33	57.0	2.46	
Booneville	75	22	45.6	1.61	
Brookhaven	83	24	53.4	1.35	
Canton	82	24	51.0	3.08	
Cleveland	83	21	51.0	3.65	
Columbus *b*	78	23	48.2	2.03	
Crystalsprings	85	26	53.0	1.87	
Edwards	82	27	53.4	1.89	
Fayette	83	27	53.9	3.30	
Fayette (near) * [1]	82	30	54.5	2.38	
Greenville *a*	78	30	51.8	3.69	
Greenville *b*	82	29	51.8	3.69	
Hattiesburg	82	28	52.4	1.69	
Hernando	77	26	48.1	1.90	
Holly Springs	76	28	47.9	2.43	
Indianola	79	25	49.6	3.52	
Jackson	86	25	53.8	2.20	
Lake	79	24	48.2	3.07	
Louisville	80	23	50.3	2.47	
Magnolia	84	23	53.5	2.43	
Natchez	86	30	57.3	2.40	
Nittayuma	80	30	53.3	4.22	
Okolona	80	20	47.9	1.15	
Palo Alto	83	25	53.4	2.53	
Pearlington	81	27	53.8	1.92	
Pittsboro	81	20	48.8	2.54	
Pontotoc	78	26	49.0	1.58	
Poplarville	87	35	57.8	2.60	
Port Gibson	84	22	54.2	2.13	
Ripley	77	19	46.4	2.14	
Shoccoe	.....	.....	.....	2.23	
Stonington * [1]	82	26	54.0	1.83	
Suffolk	84	26	54.2	3.08	
Swartwout	87	25	56.1	2.04	
Thornton	83	26	53.6	3.00	
Tupelo	.....	.....	.....	2.01	
Watervalley	83	25	51.4	2.74	
Waynesboro	84	28	54.4	2.21	
Woodville	81	30	55.2	3.26	
Yazoo City	83	24	49.7	2.29	
Missouri.					
Appleton City	77	17	45.0	1.05	
Avalon	73	15	43.2	0.37	T
Bethany	78	12	39.6	1.25	3.0
Birchtree	76	18	46.2	1.60	
Boonville	.....	.....	.....	1.60	T.
Brunswick	73	16	40.8	0.39	
Conception	68	16[b]	40.0[b]	1.18	0.5
Darksville	70[c]	15[b]	39.8[c]	0.45	1.0
Dean	77	16	48.6	3.78	
Desoto	78	15	44.6	2.33	
Downing	.....	.....	.....	0.92	T.
Edgehill * [5]	70	12	39.8	1.79	
Edwards [f]	75	15	43.0	1.21	T.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Missouri—Cont'd.	°	°	°	*Ins.*	*Ins.*
Eightmile * [3]	.....	24	42.9	0.62	
Eldon	75	14	44.2	1.38	
Fairport	.....	.....	.....	0.50	0.8
Fayette	74	18	42.4	0.93	T.
Fulton	78	13	43.0	1.50	
Galena	.....	.....	.....	2.64	
Gallatin * [1]	70	20	42.4	0.97	1.2
Gayoso	76	18	46.6	1.61	
Glasgow	75	17	42.6	0.67	T
Gorin	.....	.....	.....	0.96	0.2
Halfway	75	17	46.9	1.92	
Harrisonville	74	17	41.8	0.76	
Hazlehurst	.....	.....	.....	0.79	1.5
Hermann	.....	.....	.....	1.39	
Houston	77	21	46.5	1.91	
Irena	.....	.....	.....	1.54	3.5
Ironton	75	11	43.6	2.32	T.
Jackson	78	12	44.4	1.53	
Jefferson City	75	13	42.6	1.21	T.
Kidder	72	15	41.4	0.91	1.3
Koshkonong	77	20	48.1	2.22	
Lamar	79	20	47.4	1.65	
Lamonte	.....	.....	.....	0.97	
Lebanon	78	19	45.2	1.90	
Lexington	77	15	45.4	0.37	
Liberty	73	18	42.8	0.53	
McCune * [1]	81	10	42.1	1.45	1.0
Macon	70	15	41.4	1.00	1.0
Marblehill	75	10	43.9	1.52	
Marshall	75	17	43.4	0.71	T.
Maryville	69	17	37.9	1.80	2.0
Mexico	76	13	43.0	0.92	0.1
Miami * [5]	72	18	42.6	0.37	
Mineralspring	76	21	48.1	4.34	
Monroe City	75	13	40.4	0.88	0.5
Montreal	78	15	43.8	1.80	
Mountaingrove	77	20	46.2	1.81	
Mount Vernon	74	20	48.8	2.07	
Neosho	77	17	48.5	2.81	
Nevada	.....	.....	.....	0.97	
New Haven	78	11	44.6	1.35	
New Madrid *b*	.....	.....	.....	2.16	
New Palestine	75	18	44.7	1.27	T.
Oakfield	78	19	44.3	1.26	
Olden	75	19	48.4	1.94	
Oregon *a*	73	19	42.5	2.00	2.6
Palmyra * [5]	72	18	39.0	1.05	1.5
Phillipsburg * [1]	72	18	44.2	1.91	
Pine Hill	.....	.....	.....	1.49	
Poplarbluff	76	16	47.6	2.00	
Potosi	76	10	42.3	2.61	
Princeton	69	14	40.2	0.88	5.0
Richmond	74	19	43.6	0.41	
Rockport	.....	.....	.....	1.26	2.5
Rolla	.....	.....	.....	1.66	
St. Charles	78	17	44.0	1.15	
St. Joseph	.....	.....	.....	1.15	
Sarcoxie * [3]	.....	16	42.0	1.71	
Sedalia	74	16	44.4	1.16	
Seymour	75	19	46.0	1.91	
Sikeston	75	16	45.6	1.73	
Steffenville	73	10	40.4	1.13	0.1
Sublett [c]	70	11	40.1	0.90	1.0
Trenton	70	17	40.9	1.01	3.0
Unionville	70	15	40.3	0.88	1.0
Vichy	74	15	44.4	1.75	
Warrensburg	75	16	44.0	0.83	
Warrenton	76	19	42.1	1.59	
Wheatland	.....	.....	.....	2.30	
Windsor	75	18	45.4	1.10	
Zeitonia	84	16	45.3	2.03	
Montana.					
Anaconda	57	12	37.8	0.25	2.5
Augusta	58	12	38.2	0.09	0.5
Billings	70	17	37.4	.....	.....
Boulder	60	12	35.4	0.18	T.
Bozeman	61	14	38.1	0.73	4.0
Butte	55	20	37.2	T.	
Canyon Ferry	64	18	37.6	0.38	
Chester	63	6	31.6	0.07	0.5
Columbia Falls	50	20	36.0	2.14	0.5
Crow Agency	72	16	40.0	0.10	T.
Culbertson	68	— 3	28.1	0.19	1.0
Deerlodge	.....	17	.....	0.25	
Dillon	60	14	37.0	0.46	2.1
Fort Benton	60	16	36.6	1.45	11.5
Fort Logan	54	15	34.6	T.	
Glasgow	76	6	31.6	0.84	.....
Glendive	72	7	34.0	0.40	4.0
Glenwood	65	10	37.4	0.05	
Greatfalls	62	16	43.2	0.02	0.1
Lewistown	68	12	38.6	0.05	0.5
Livingston	64	23	44.4	0.23	0.3
Manhattan	65	10	36.8	0.03	T.
Martinsdale	64	12	38.8	0.00	
Marysville	52	22	35.6	0.50	1.5

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Montana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Missoula	55	22	37.3	0.69	T.
Ovando	51	12	31.2	1.51	4.5
Parrot	62	14	39.1	0.13	1.5
Plains	57	26	39.8	0.80	0.5
Poplar	68	4	28.4	1.00	10.0
Ridgelawn	67	5	30.0	0.50	5.0
St. Pauls	64	11	39.0	0.52	4.6
St. Peter	58	13	38.8	0.11	1.0
Springbrook	65	4	36.7	1.41	5.5
Toston	63	11	38.2	0.05	T.
Troy	53	24	37.7	3.36	T.
Utica	79	14	42.8	T.	
Yale	64	9	34.2	0.02	
Nebraska.					
Agate				0.20	0.5
Agee [*1]	65	16	35.2	0.88	0.8
Albion	69	13	38.6	1.43	T.
Alliance				T.	T.
Alma	74	14	41.2	0.49	T.
Ansley	65	15	36.8	0.52	T
Arapahoe [*1]	68	20	43.0	0.48	
Arborville [*1]	70	16	37.9	0.70	T.
Arcadia				0.60	
Arlington				1.37	1.5
Ashland *a*	68	15	40.6	0.71	T.
Ashland *b* [*1]	66	13	39.8	0.70	T.
Ashton				1.04	
Auburn	69	14	41.6	1.55	1.0
Aurora	67	10	39.6	0.84	
Bartley				0.28	
Beatrice	68	15	41.1	0.83	
Beaver	80	16	42.8	0.41	
Bellevue				0.62	2.0
Benedict				0.87	
Benkleman				0.15	
Blair	66	12	36.8	1.26	1.0
Bluehill [*1]	70	20	41.6	0.60	T.
Bradshaw				1.03	
Brokenbow	67	14	39.4	0.75	
Burchard				0.90	
Burwell				0.73	
Callaway	63	20	40 6	1.15	
Camp Clarke	74	12	39.9	T.	T.
Central City				1.87	
Chester				1.26	
Cody				0.00	
Columbus	66	12	38.0	0.78	T.
Crete	69	15	40.7	0.26	
Cuibertson				0.31	
Curtis	68[3]	16[3]	40.3[3]	0.35	
Dannebrog				1.05	
David City	63	16	37.8	T.	T.
Dawson	71	16	43.9	1.08	1.5
Eden				1.10	1.5
Edgar *a* [*5]	67	19	42.4	0.50	
Erieson				1.00	T.
Ewing				0.85	
Fairbury	71	14	41.0	0.20	T.
Fairmont	67	16	38.4	0.46	
Fort Robinson	71	16	39.8	0.05	0.5
Fremont	66	14	38.1	0.75	1.0
Fullerton				1.10	
Geneva	68	16	39.2	0.11	T.
Genoa	65	17	38.5	1.30	
Gering	71			T	
Gordon				0.00	
Gosper				0.50	
Gothenburg	68	15	40.2	0.58	
Grand Island *a*				0.70	
Grand Island *b*	68	16	40.4	1.00	
Grand Island *c*	68	17	40.2	0.97	
Greeley				0.90	
Guide Rock				0.33	
Haigler				0.00	
Hartington	68	10	34.9	1.07	0.5
Harvard	67	17	39.4	0.71	
Hastings [*1]	64	17	40.6	0.73	
Hayes Center				0.00	
Hay Springs	68	16	39.0	T.	T.
Hebron	70	15	41.6	0.13	
Hickman				0.45	T.
Holbrook				0.40	
Holdrege	70	17	41.5	0.70	T.
Hooper [*1]	65	14	36.3	0.62	0.8
Imperial	75	12	41.5	T.	T.
Johnstown				0.06	0.6
Kearney		19		0.82	
Kimball	69	12	40.6	0.05	0.5
Kirkwood [*1]	70	12[1]	34.9[2]	0.59	T.
Laclede	65	15	39.4	1.70	T.
Lexington	68	11	39.6	0.41	
Lodgepole	74	10	40.6	T.	T.
Loup				0.95	
Lynch	72	8	35.8	0.41	
Lyons				1.20	0.5
McCook [*1]	73	22	42.0	0.31	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Madison	65	14	38.4	1.24	T.
Madrid				0.00	
Marquette				1.08	
Mason City				0.46	
Minden *a*	69	15	40.1	0.79	T.
Monroe				0.99	T.
Nebraska City *b* [*1]	68	22	41.0	0.70	T.
Nemaha [*1]	70	18	43.0	0.82	1.2
Nesbit	68	10	39.4	0.16	T.
Norfolk	65	12	36.3	1.27	0.2
North Loup	68	15	39.2	1.07	
Oakdale	65	11	36.4	1.05	0.2
Odell				0.75	
O'Neill	75	14	38.0	0.90	T.
Ord				0.88	
Osceola				0.60	0.1
Palmer				0.70	
Palmyra [*1]	70	16	38.3	0.70	
Plattsmouth *b*				0.80	2.0
Ravenna *a*	66	16	39.7	0.84	0.1
Ravenna *b*				0.85	
Redcloud *b*	74	13	39.6	0.09	
Rulo				1.00	0.1
St. Libory				0.98	
St. Paul	68	16	40.8	1.04	
Salem [*1]	62	16	40.3	0.65	1.0
Santee	73	11	38.5	0.82	1.0
Schuyler				0.70	
Seneca [*1]	68	20	37.8	0.00	
Seward				0.48	
Smithfield				0.40	
Sprague				0.31	
Springview	66	9	40.0	T.	
Stanton	67	12	37.6	1.54	0.8
State Farm	69	14	40.6	0.42	T.
Strang				0.18	
Stratton				0.66	
Superior				0.18	
Syracuse				0.55	
Tablerock				0.72	0.5
Tecumseh *b*	69	15	39.6	0.78	
Tecumseh *c*				0.84	T.
Tekamah	70	13	37.7	0.88	1.0
Turlington	67	15	40.3	0.63	1.7
Wakefield	67	10	35.9	1.15	0.7
Wallace				0.00	
Wauneta				0.00	
Weeping Water				0.56	1.0
Westpoint	69	12	37.8	0.96	1.0
Whitman				T.	T.
Wilber [*1]	74	22	40.8	0.40	
Willard				0.42	
Wilsonville				0.66	
Winnebago				0.62	T.
Wisner				1.14	0.5
Wymore				0.80	T.
York				0.20	
Nevada.					
Amos	59	22	39.0	0.11	
Austin	61	24	43.6	0.88	
Battle Mountain [*1]	73	18	44.8	0.45	
Belmont	58	23	39.8	0.07	T.
Beowawe [*1]	67	28	43.2	0.50	
Candelaria	78	28	49.9	0.15	T.
Carlin [*1]	68	25	45.0	0.25	
Carson City	76	20	44.0	1.07	
Cranes Ranch				0.76	
Elko [*1]	64	16	35.7	0.80	
Elko (near)	76	15	41.1	0.80	
Ely	62	18	38.9	0.45	2.0
Fenelon [*1]	60	22	37.4	0.05	0.5
Golconda [*1]	68	29	50.0	T.	
Halleck [*1]	65	18	36.3	0.01	T.
Hamilton	61	15	37.8	T.	T.
Hawthorne	71	26	47.4	0.31	
Hot Springs [*5]	72	24	49.2	T.	
Humboldt [*1]	67	29	47.2	0.40	
Lee				0.96	3.0
Lewers Ranch	71	25	45.4	3.30	0.2
Lovelocks *a* [*1]	70	29	44.3	1.05	
Lovelocks *b*	70	21	44.2	1.10	
Martins	80	19	45.8	1.09	
Mill City [*1]	58	25	40.0	0.50	
Owyhee	63	12	41.4	0.32	
Palisade [*1]	66	15	35.4	0.54	
Palmetto	71	15	42.2	0.10	
Reno State University	73	24	43.8	0.68	
Silverpeak	70	24	44.9	T.	
Sodaville	75	30	51.6	0.12	
Tecoma [*1]	70	25	44.5	T.	
Toano [*5]	61	18	40.0	0.08	T.
Tybo	65	24	40.7	0.25	T.
Verdi [*5]	76	28	51.0	0.15	
Wadsworth [*1]	68	20	43.1	0.33	
Woods	60	17	39.1	0.60	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	recipitation. Rain and melted snow.	Total depth of snow.
New Hampshire.	°	°	°	*Ins.*	*Ins.*
Alstead	66	1	30.6	1.21	5.0
Berlin Mills	60	— 1	27.6	1.89	15.0
Bethlehem	55	0	27.8	2.41	20.5
Brookline [*1]	65	— 2	31.1	1.47	3.0
Chatham	59	— 3	30.2	0.48	7.0
Concord	62	7	30.9	1.34	4.1
Durham	71	7	34.7	1.58	
Franklin Falls	60	8	31.0	1.33	4.8
Hanover	62	2	29.8	1.35	4.0
Keene	61	0	31.4	1.79	4.2
Littleton	57	1	26.3	1.91	15.6
Nashua	66	7	32.8	1.70	4.5
Newton	65	4	32.6	2.80	1.5
Peterboro	62	2	31.0	1.98	4.5
Plymouth	55	8	29.0	1.77	10.8
Sanbornton	60	6	30.6	1.53	3.0
Stratford	60	4	28.4	1.93	17.0
New Jersey.					
Asbury Park	62	17	40.0	1.98	T.
Bayonne	65	18	39.2	1.36	0.5
Belvidere	61	15	36.6	1.75	2.5
Bergen Point	62	18	38.8	1.84	0.2
Beverly	66	18	40.0	3.69	0.6
Blairstown	58	16	35.4	1.50	0.9
Bridgeton	66	19	41.4	2.85	0.5
Camden	67	19	40.0	3.34	0.8
Cape May C. H.	69	18	41.2	2.58	0.2
Charlotteburg	59	13	34.5	1.83	2.0
Chester	59	10	34.8	2.10	1.0
Clayton	64	17	39.6	2.76	0.5
College Farm	61	18	38.6	2.21	0.8
Dover	61	15	35.2	1.84	1.5
Egg Harbor City	69	15	39.4	3.56	T.
Elizabeth	62	17	38.2	1.97	1.0
Englewood				1.79	0.8
Flemington	60	18	37.9	1.79	1.3
Freehold	61	16	37.8	2.64	T.
Friesburg	64	18	40.0	2.77	1.5
Hanover	68	15	35.7	1.62	0.5
Hightstown	61	19	39.2	3.05	1.0
Imlaystown	63	17	39.8	3.31	0.2
Indian Mills	68	12	39.5	3.79	T.
Lakewood	64	15	39.4	2.17	T.
Lambertville	64	19	38.3	1.96	1.5
Layton	58	13	33.8	1.94	3.0
Moorestown	62	16	39.8	4.23	1.1
Mount Pleasant				3.13	T.
Newark	60	17	37.7	1.70	1.0
New Brunswick	65	18	39.4	2.16	0.5
New Egypt				2.20	T.
Newton	58	15	34.9	2.17	2.0
Oceanic	59	18	39.8	2.43	T.
Paterson	65	18	40.0	1.58	0.5
Perth Amboy	63	18	39.3	1.80	0.8
Plainfield	62	16	36.8	2.17	1.0
Rancocas				3.22	1.0
Rivervale	62	15	36.5	2.62	3.0
Roseland	62	14	35.7	1.64	0.5
Salem	70	19	41.6	2.93	1.9
Somerville	62	17	38.1	2.12	1.0
South Orange	61	16	37.7	1.18	0.5
Sussex	57	15	35.5	2.60	2.0
Three Bridges				2.16	1.2
Toms River	69	10	38.4	2.13	T.
Trenton	62	20	42.0	2.72	1.0
Tuckerton	69	15	39.2	3.70	T.
Vineland	67	16	40.2	2.82	0.5
Woodbine	68	14	39.8	2.55	1.0
Woodstown				2.70	0.5
New Mexico.					
Alamagordo	75	28	50.7	2.13	
Albert	74	29	49.8	1.80	
Albuquerque	71	20	46.8	1.03	
Alma	73	24	48.8	0.68	
Aztec	71	17	42.2	0.48	
Bellranch				2.61	
Bluewater	69	12	39.2	0.80	
Cambray				0.70	
Carlsbad	87[3]	30[3]	56.6[3]	0.22	
Deming				0.31	
East Lasvegas	59	28	43.2	1.78	5.0
Engle	72	28	50.2	1.07	
Folsom	65	18	41.8	0.95	1.5
Fort Bayard	67	31	48.6	0.46	
Fort Stanton				2.85	
Fort Union	73	18	43.9	0.95	7.0
Fort Wingate	73	22	46.6	1.25	1.2
Gage				1.00	
Gallisteo	68	21	42.9	1.08	
Gallinas Spring	70	28	46.2	3.10	
Horse Springs	66	18	42.8	1.60	
Las Vegas	68	20	42.8	1.50	2.0
Las Vegas Hotsprings	67	22	44.2	1.08	1.8
Lordsburg				0.76	
Mesilla Park	77	27	51.8	0.98	
Roswell	78	27	50.2	6.15	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
New Mexico—Cont'd.	°	°	°	*Ins.*	*Ins.*
San Marcial	77	25	50.6	0.01	
Socorro	72	37	48.0	1.32	
Springer	71	11	41.4	0.85	
Strauss	.....	.....	.....	1.10	
Winsor Ranch	64	13	36.6	0.85	6.0
Woodbury	67	25	45.2	0.57	T.
New York.					
Addison	64	11	33.8	2.00	0.5
Adirondack Lodge	60	— 2	25.6	4.18	36.6
Akron	.....	.....	.....	2.86	.....
Alden	64	12	35.2	2.46	6.3
Alfred	70	9	31.9	2.38	3.5
Angelica	62	4	31.4	2.88	8.0
Appleton	67	16	36.6	2.51	4.3
Athens	.....	.....	.....	1.32	1.5
Atlanta	60	1	30.7	2.90	10.0
Atwell	66	2	27.2	.....	.....
Auburn	65	12	34.2	4.02	13.5
Avon	61	11	33.8	1.27	.....
Axton	55	0	26.6	.....	.....
Baldwinsville	61	11	34.2	4.69	15.5
Bedford *a*	60	9	36.0	1.56	1.0
Blue Mountain Lake	.....	.....	.....	2.95	10.0
Bolivar	62	7	30.6	3.41	8.0
Bouckville	63	4	31.4	3.74	29.0
Boyds Corners	.....	.....	.....	2.15	.....
Brockport	62	15	34.6	3.85	9.0
Caldwell	61	4	32.8	1.60	3.0
Canaan Four Corners	58[e]	0[e]	30.2[e]	2.10	14.5
Canton	60	0	31.2	3.20	9.5
Carmel	58	10	35.1	2.08	1.0
Carvers Falls	62	2	31.0	1.68	T.
Catskill	68	12	36.1	0.29	1.0
Cedarhill	63	11	34.6	2.06	2.7
Chenango Forks	.....	.....	.....	2.65	4.0
Cherry Creek	.....	.....	.....	5.56	27.0
Cooperstown	55	7	30.4	2.74	9.0
Cortland	.....	.....	.....	3.47	13.0
Cutchogue	65	16	39.5	2.44	T.
Dekalb Junction	.....	.....	.....	3.84	29.5
Easton	.....	.....	.....	1.99	6.5
Elba	64	13	34.3	2.49	.....
Elmira	61	15	35.4	2.75	1.0
Fayetteville	63	10	33.6	3.20	23.0
Franklinville	62	1	31.0	4.14	13.8
Fulton	.....	.....	.....	4.04	18.6
Gabriels	59	0	25.6	2.38	21.5
Glens Falls	61	5	32.7	1.29	3.0
Gloversville	60	6	30.2	2.23	5.5
Greenwich	57	3	32.1	1.87	3.0
Griffin Corners	62	3	29.8	2.26	12.0
Haskinville	.....	.....	.....	2.45	9.9
Hemlock	58	15	34.8	1.78	2.0
Honeymead Brook	59	8	33.8	1.84	0.8
Humphrey	59	8	30.1	4.24	17.7
Indian Lake	70	2	28.4	1.21	5.1
Ithaca	61	12	32.7	2.74	9.2
Jamestown	60	10	34.0	4.81	.....
Jay	65	—14	30.8	0.79	5.5
Keene Valley	62	— 1	29.4	1.92	15.7
King Ferry	.....	.....	.....	3.40	12.0
King Station	.....	.....	.....	1.48	4.0
Littlefalls, City Res.	61	5	30.1	2.86	15.5
Lockport	67	15	39.8	3.36	6.0
Lowville	60	— 1	29.0	4.05	19.5
Lyndonville	.....	.....	.....	3.18	.....
Lyons	64[f]	15[f]	36.2[f]	2.72	14.0
Mayle	.....	.....	.....	2.21	1.0
Meredith	56	2	27.9	2.98	13.5
Middletown	61	15	35.8	2.17	2.5
Mohonk Lake	60	7	32.8	2.49	.....
Moira	65	2	29.8	4.36	26.0
Newark Valley	.....	.....	.....	3.37	7.0
New Lisbon	59	4	28.8	2.08	8.2
New Rochelle	60	13	35.7	1.13	T.
North Hammond	60	8	31.6	2.09	11.5
Number Four	58	—10	27.3	7.52	51.2
Nunda	58	8	32.6	2.30	2.0
Ogdensburg	59	3	30.4	2.15	10.2
Old Chatham	.....	.....	.....	2.80	7.0
Oneonta	64	8	31.9	2.15	3.6
Oxford	63	8	31.6	3.12	8.4
Palermo	.....	.....	.....	4.23	29.8
Penn Yan	61	14	34.2	1.49	1.4
Perry City	59	3	31.2	3.36	13.9
Plattsburg Barracks	63	1	32.0	.....	.....
Port Byron	63[j]	13	34.8[e]	4.35	.....
Port Jervis	60	15	35.0	3.09	2.0
Primrose	67	14	36.0	1.98	1.2
Redhook	.....	.....	.....	1.44	.....
Richmondville	60	10	30.9	1.62	4.5
Ridgeway	63	15	35.7	3.59	12.8
Rome	55	9	32.4	.....	.....
Romulus	71	13	34.9	2.92	5.8
Sallsbury Mills	.....	.....	.....	2.55	T.
Saranac Lake (near)	63	1	27.0	2.30	17.3
New York—Cont'd.	°	°	°	*Ins.*	*Ins.*
Saratoga Springs	64	4	32.6	1.56	2.2
Schenectady	60	9	33.6	1.19	3.8
Setauket	60	16	39.8	1.94	0.3
Shortsville	62	11	33.7	1.87	8.0
Skaneateles	.....	.....	.....	4.05	.....
Southampton	60	16	39.4	2.01	T.
South Canisteo	58	11	32.4	2.64	4.5
South Berlin	.....	.....	.....	2.30	14.0
Southeast Reservoir	.....	.....	.....	2.06	
South Kortright	63	5	30.0	2.57	17.7
South Schroon	60	0	28.6	1.37	6.2
Straits Corners	62	5	30.9	4.12	13.2
Ticonderoga	63	5	34.0	1.25	4.0
Volusia	62	14	33.8	5.50	17.0
Walton	66	9	31.0	2.53	7.4
Wappingers Falls	62	10	35.8	2.37	2.2
Warwick	.....	.....	.....	2.08	2.0
Watertown	66	0	32.4	4.90	19.3
Waveriy	65	13	33.4	3.47	5.2
Wedgwood	60	9	31.3	2.90	7.5
Wells	60	0	29.3	1.54	4.5
West Berne	62	6	30.9	2.77	9.8
West Chazy	62	— 1	30.0	.....	.....
Westfield *a*	63	18	37.2	4.40	2.7
Westfield *b*	63	16	35.6	4.07	.....
Westfield *c*	67	19	38.9	2.83	.....
Windham	59	0	33.0	2.93	15.0
Wolcott	.....	.....	.....	2.87	13.0
North Carolina.					
Abshers	79	15	42.3	1.22	T.
Asheville	.....	.....	.....	0.73	T.
Bryson City	.....	.....	.....	1.19	
Chapelhill	79	20	43.6	1.94	
Cherryville	78	20	44.8	1.10	
Currituck	.....	.....	.....	2.75	
Edenton	75	20	45.4	1.51	
Fayetteville	80	18	47.0	0.73	
Goldsboro	74	19	44.2	1.25	
Greensboro	75	20	42.8	0.82	
Henderson	74	19	42.6	1.29	
Hendersonville	76	15	41.6	1.32	
Henrietta	79	19	44.2	0.95	
Highlands	71	14	39.3	1.13	
Horse Cove	72	18	42.7	1.41	1.5
Kinston	80	16	45.2	2.48	
Lenoir	79	15	41.8	0.72	
Linville	61	7	33.4	0.52	
Littleton	77	22	43.4	1.65	
Louisburg	75	16	43.2	1.23	
Lumberton	77	19	45.0	1.01	
Marion	79	18	44.2	1.16	
Marshall	.....	.....	.....	0.59	T.
Mocksville	76	15	42.1	1.00	
Moncure	76	18	43.8	1.70	
Monroe	80	14	42.4	0.64	
Morganton	72	16	43.4	1.00	
Mountairy	75	16	41.2	1.41	
Murphy	.....	.....	.....	1.70	
Newbern	81	25	48.2	2.07	
Oakridge	80	21	43.2	1.18	T.
Patterson *l*	72	19	37.4	0.74	
Pittsboro	75	11	38.8	1.37	
Redsprings	82	17	45.3	1.01	
Reidsville	.....	.....	.....	0.89	
Rockingham	.....	17	.....	0.80	
Roxboro	75	20	43.2	1.73	
Salem	75	17	42.1	1.15	
Salisbury	80	21	45.8	0.75	
Saxon	78	17	42.7	1.39	T.
Selma	78	16	43.4	0.86	
Settle	75	20	44.6	1.30	
Sloan	81	16	46.6	1.98	
Soapstone Mount	60	13	37.2	1.03	
Southern Pines *a*	83	20	47.8	1.93	
Southern Pines *b*	78	20	46.6	1.25	
Southport	77	23	50.2	1.12	
Springhope *l*	80	19	45.6	1.85	
Tarboro	80[e]	18[e]	46.0[e]	1.23	
Washington	76	21	48.3	2.57	
Waynesville	67	15	38.9	0.61	T.
Weldon *a*	75	20	43.2	1.52	
Weldon *b*	.....	.....	.....	1.55	
North Dakota.					
Amenia	59	3	27.0	T.	T.
Ashley	55	2	26.6	0.10	1.0
Berlin	62	— 2	27.2	0.30	3.0
Buxton	54	2	26.8	0.00	
Cando	54	0	23.4	T.	T.
Coalharbor	61	3	25.8	0.65	6.5
Devils Lake	53	3	24.8	T.	T.
Dickinson	67	1	31.2	0.80	8.0
Donnybrook	.....	.....	.....	0.35	3.5
Dunseith	54	— 5	23.6	T.	
Edgeley	65	5	29.8	0.15	2.0
Ellendale	64	4	30.6	0.20	2.0
Fargo	57	2	25.0	0.00	
North Dakota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Forman	60	— 2	28.8	0.37	3.7
Fort Yates	65	5	30.8	0.32	3.2
Fullerton	65	3	27.4	0.21	2.1
Gallatin	54	— 4	23.2	0.01	0.1
Glenullin	65	2	32.4	0.35	3.5
Grafton	50	0	24.6	T.	T.
Hamilton	50	— 2	22.8	0.10	1.0
Hannaford	55	0	26.0	T.	
Jamestown	57	— 1	25.1	0.00	
Larimore	55	0	23.4	0.00	
McKinney	64[e]	— 7[e]	34.6[e]	0.15	1.5
Mayville	55	3	26.7	0.00	
Medora	70	7	32.4	0.30	3.0
Melville	58	2	28.2	T.	T.
Milton	50	— 4	21.5	0.02	T.
Minto	52	0	24.0	0.10	1.0
Napoleon	62	4	27.5	0.32	3.0
New England	67	3	31.6	0.20	2.0
Oakdale	64	— 1	32.4	0.63	6.0
Pembina	48	— 4	21.9	0.08	0.7
Portal	59[d]	— 2	27.3	0.10	1.0
Power	58	4	27.1	0.20	2.0
Steele	63	3	27.6	0.10	1.0
Wahpeton	57	3	29.4	0.50	5.0
Willow City	56	— 4	23.8	T.	
Woodbridge	51	— 5	23.9	0.10	1.0
Ohio.					
Akron	68	19	36.3	1.83	5.6
Annapolis	65	15	34.8	0.91	.....
Atwater	.....	.....	.....	2.47	4.9
Bangorville	65	10	37.0	1.30	1.5
Bellefontaine	66	18	37.4	1.65	2.0
Bement	.....	.....	.....	2.89	4.0
Bethany	72	20	41.5	1.06	
Binola	.....	.....	.....	2.35	5.5
Bladensburg	67	11	35.6	1.41	0.2
Bloomingburg	72	16	38.7	0.64	T.
Bowling Green	61	12	36.4	2.33	1.2
Cambridge	71	15	37.6	1.09	T.
Camp Dennison	75	13	39.4	0.80	T.
Canaan	.....	.....	.....	1.96	2.0
Canal Dover	67	18	35.6	1.42	1.5
Canton	66	20	36.7	1.91	4.0
Cardington	69	11	37.0	1.11	1.0
Cedarville	.....	.....	.....	0.68	0.5
Celina	75	10	37.2	0.95	1.0
Circleville	71	17	39.0	0.98	0.2
Clarksville	75	16	39.5	0.90	T.
Cleveland *a*	66	24	39.0	2.91	8.3
Cleveland *b*	68	22	37.3	1.85	2.9
Clifton	72	14	38.7	0.82	T.
Coalton	74	12	39.1	1.84	1.3
Dayton *a*	.....	.....	.....	0.16	0.1
Dayton *b*	72	14	38.4	1.43	0.5
Defiance	68	12	37.2	1.41	0.6
Delaware	70	14	37.2	0.92	2.5
Demos	67	16	36.8	1.86	1.0
Findlay	70	14	39.0	0.94	T.
Frankfort	72	17	37.6	1.02	T.
Fremont	67	15	37.7	1.87	1.0
Garrettsville	67	11	36.0	3.04	9.6
Granville	70	12	37.4	1.13	2.0
Gratiot	68	15	36.8	1.45	5.0
Green	74[d]	16	38.9[b]	1.50	T.
Greenfield	69	21	39.4	0.95	T.
Greenhill	68	15	35.0	1.72	4.6
Greenville	68	19	37.8	0.73	0.2
Hanging Rock	75	16	39.5	2.25	T.
Hedges	65	14	38.0	1.35	T.
Hillhouse	66	16	35.4	4.24	8.7
Hillsboro	74	14	36.4	0.91	
Hiram	60	17	36.0	3.11	9.0
Hudson	67	17	35.4	3.10	9.0
Killbuck	67	15	37.2	0.64	1.0
Lancaster	70	15	38.0	1.23	1.0
Leipsic	.....	.....	.....	1.01	0.5
Lima	68	11	38.0	1.32	1.0
Logan	72[e]	19[e]	41.5[e]	.....	.....
McConnelsville	72	17	37.7	1.79	1.2
Manara	72	16	38.2	0.72	0.3
Mansfield	.....	.....	.....	2.37	1.6
Marietta	70	21	39.8	2.15	T.
Marion	70	12	38.0	0.96	T.
Medina	69	16	36.6	2.38	8.0
Milfordton	73	12	35.8	0.91	0.2
Milligan	71	11	37.2	1.25	T.
Millport	67	14	35.2	2.28	4.4
Montpelier	60	16	36.3	1.71	2.0
Moorefield	68[j]	17	34.8[j]	1.11	1.0
Napoleon	69	16	38.7	1.27	T.
New Alexandria	68	16	37.1	0.75	1.0
New Berlin	68	18	37.2	2.00	5.0
New Bremen	68	15	37.4	1.25	2.0
New Paris	69	17	37.6	0.76	T.
New Richmond	78	21	41.8	1.06	T.
New Waterford	65	13	36.4	3.51	10.2

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins.*
North Lewisburg	68	15	36.4	1.10	T.
Norwalk	71	19	38.4	1.49	1.0
Oberlin	69	16	37.7	2.31	6.5
Ohio State University	70	14	36.8	0.61	0.4
Orangeville	69	18	36.2	2.88	8.0
Ottawa	68	14	37.7	1.64	T.
Pataskala	70	14	37.0	1.09	1.7
Philo	72	15	38.2	0.88	0.8
Plattsburg	70	14	36.6	0.79	2.0
Pomeroy	71	17	39.6	1.89	0.5
Portsmouth[a]				1.56	T.
Portsmouth[b]	75	20	41.6	1.56	T.
Pulse				0.78	T.
Red Lion				0.86	T.
Richfield				2.30	0.5
Richwood	70	15	37.7	1.02	1.0
Ripley	74	18	39.7	1.40	T.
Rittman	79	18	38.0	3.03	2.1
Rock				1.80	1.5
Rockyridge	70	10	37.5	2.03	0.8
Shenandoah	69	11	35.6	1.55	2.8
Sidney	79	12	36.8	1.30	0.8
Somerset	70	20	39.1	1.08	0.2
Springfield				0.88	0.5
Strongsville				2.11	4.0
Swanton				1.92	T.
Thurman	73	16	39.6	2.15	0.5
Tiffin	67	14	37.5	1.36	2.5
Upper Sandusky	68	14	38.0	1.30	T.
Urbana	69	18	37.2	0.81	0.5
Vanwert	67	18	37.7	1.28	0.8
Vermillion	69	11	36.9	1.96	5.0
Vickery	71	13	37.2	1.59	0.6
Walnut				1.04	0.4
Warren	68	17	37.0	2.37	9.1
Warsaw	68	10	36.2	1.26	
Wauseon	64	11	36.6	1.61	1.4
Waverly	74	16	40.4	1.74	0.4
Waynesville	74	16	38.2	1.00	
Wellington	68	16	37.2	1.36	2.5
Willoughby				2.04[d]	
Wooster	67	15	36.6	1.62	2.4
Zanesville				1.19	2.0
Oklahoma.					
Arapaho	86	22	53.2	0.27	
Beaver	75	21	46.3	0.22	
Blackburn	82	18	49.0	1.26	
Burnett	80	20	52.5	1.51	
Chandler[b]	74	25	50.4	0.50	
Clifton	80	22	50.8	2.65	
Cloud Chief	83	27	56.0	0.70	
Fort Reno	85	24	52.0	0.82	
Fort Sill	89	27	54.2	1.30	
Guthrie	79	25	51.9	1.94	
Hennessey	83	20	50.2	0.97	
Jenkins	75	18	48.6	0.30	
Kenton	81	20	47.5	0.50	
Kingfisher	85	22	51.2	0.70	
Lyons	83	20	50.1	0.58	
Mangum	84	32	53.0	0.80	
Newkirk	72	25	50.8	1.25	
Norman	80[c]	24[c]	50.4[c]	1.06	
Pawhuska	79	19	49.1	1.26	
Perry	82	20	51.0	0.86	
Sac and Fox Agency	80	21	50.4	2.42	
Shawnee	81	25	53.2	1.38	
Stillwater	81	23	51.8	0.95	
Taloga	84	23	49.1	0.24	
Waukomis	85	21	52.0	0.85	
Weatherford	73	26	48.6	0.47	
Woodward	78	22	51.1	0.00	
Oregon.					
Albany[a]	68	39	50.2	5.46	
Albany[b]				5.59	
Alpha	71	32	49.2	11.32	
Ashland[b]	67	25	46.6	1.41	
Aurora	68	35	48.1	5.33	
Aurora (near)	65	32	46.7	6.72	
Bay City	65	34	50.1	17.74	
Beulah	67	8	35.8	0.62	
Buckbutte	65	29	47.3	4.45	
Blalock	72	30	45.8	1.17	
Brownsville	70	28	51.1	4.56	
Bullrun	59	33	45.3	9.18	
Cascade Locks	69	38	49.6	11.32	
Comstock	65	36	49.5	4.95	
Coquille				7.40	
Corvallis	69	32	47.4	6.21	
Dayville	73	18	46.8	0.67	T.
Ella				1.05	
Eugene	66	33	49.0	4.34	
Fairview	64	31	49.1	5.56	
Falls City	61	31	45.7	13.84	
Forestgrove	64	29	46.7	8.78	
Gardiner	72	36	49.2	10.43	
Glenora	56	31	45.2	18.36	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Oregon—Cont'd.	°	°	°	*Ins.*	*Ins.*
Government Camp	63	22	39.4	6.37	19.0
Grants Pass	67	22	46.1	2.27	
Hare	71	37	50.8	12.97	
Heppner	75	25	45.2	0.70	
Hood River (near)	73	28	44.8	6.29	
Huntington	67	17	42.9	0.50	
Jacksonville	66	26	45.4	2.31	
Joseph	64	14	35.8	0.88	4.0
Junction City	78	38	53.7	3.28	
Kerby	65	26	46.0	7.41	
Klamath Falls	58	20	40.8	1.29	
Lafayette	60	32	47.5	3.67	
Lagrande	65	23	43.9	1.80	
Lakeview	66	18	41.5	1.73	T.
Lonerock	71	23	43.8	1.64	
McMinnville	68	30	46.8	7.71	
Merlin	64	26	47.6	2.86	
Monroe	68	31	47.8	6.40	
Mount Angel	65	33	47.6	7.29	
Nehalem				17.13	
Newberg	68	32	47.4	7.67	
Newport	65	36	51.6	11.08	
Pendleton	76	23	46.4	1.39	
Pine	57	9	36.4	0.58	
Placer				5.04	
Prineville	75	17	48.4	0.15	
Riddles	76	30	52.4	3.92	
Riverside	65	12	38.8	0.44	T.
Sheridan	65	34	49.8	5.70	
Silverlake	77	13	41.0	0.57	
Silverton	68	36	49.2	5.31	
Siskiyou	64	32	45.6	2.17	0.5
Sparta	53	30	38.6	1.92	T.
Stafford	66	30	46.8	8.08	
The Dalles	71	30	45.8	1.69	
Tillamook				6.15	
Toledo	75	30	50.8	10.05	
Umatilla				0.49	
Vale	68	8	37.6	0.51	
Westfork	62	36	48.6	2.39	
Weston	69	23	45.4	1.99	
Williams	63	23	44.8	3.28	
Pennsylvania.					
Aleppo	70	18	36.8	2.77	2.5
Altoona	64	16	34.8	2.03	
Athens	66	11	33.6	3.10	1.5
Beaver Dam				2.19	1.0
Bellefonte	67	16	37.6	2.28	1.5
Bethlehem				1.35	
Brookville				3.94	8.5
Browers Lock				3.02	
California	76	18	40.6	2.25	1.8
Cassandra	60	13	33.7	3.73	15.0
Centerhall	66	7	32.3	2.46	2.0
Clarion				4.69	16.0
Coatesville	65	18	39.0	2.82	2.1
Confluence				2.88	5.6
Davis Island Dam				2.12	0.8
Derry Station	65	18	35.3	3.45	3.5
Driftwood				1.48	T.
Duncannon				1.78	T.
Dushore	68	9	31.6	2.87	1.7
Dyberry	62	11	31.2	2.15	2.9
East Bloomsburg				2.18	T.
East Mauch Chunk	63	16	36.2	2.00	2.2
Easton	58	18	36.3	1.53	1.2
Ellwood Junction				3.09	6.0
Emporium	62	17	34.9	2.94	3.7
Ephrata	65	17	38.1	1.39	1.0
Everett	65[a]	14[d]	34.1[d]	2.50	4.2
Forks of Neshaminy	58	19	35.4	2.40	2.0
Franklin	66	12	36.4	2.98	4.5
Freeport				3.13	5.0
Girardville				2.51	3.8
Greensboro				2.74	0.2
Hamburg				2.19	2.0
Hamlinton	71	10	33.4	3.80	2.2
Hawthorn	69	9	34.6	3.86	7.0
Herrs Island Dam				1.64	2.0
Huntingdon[a]	67	16	36.7	1.59	0.7
Huntingdon[b]				0.94	0.5
Irwin				2.22	1.0
Johnstown	66	16	36.6	2.90	6.0
Karthaus				1.06	
Keating				2.49	T.
Kennett Square	62	18	38.8	3.15	
Lancaster	70	19	38.4	1.61	0.5
Lawrenceville	63	10	31.8	2.78	0.8
Lebanon	65	18	37.4	1.39	0.4
Leroy	61	10	32.2	2.83	3.0
Lewisburg	68	17	36.4	1.75	0.3
Lockhaven[a]	69	18	38.0	2.77	1.0
Lockhaven[b]				2.90	T.
Lock No. 4				1.75	1.0
Lycippus	70	16	35.5	3.02	4.0
Mifflin				2.50	1.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Pennsylvania—Cont'd.	°	°	°	*Ins.*	*Ins.*
Oil City				3.92	4.2
Parker				4.53	6.4
Philadelphia	66	21	41.8	2.92	1.5
Pocono Lake	58	10	31.0	1.69	5.2
Pottstown	63	22	40.8	1.85	1.5
Quakertown	68	16	38.0	1.97	1.0
Reading[2]			36.6	1.79	
Renovo[a]				2.65	0.5
Renovo[b]	65	17	36.5	2.62	2.2
Saegerstown	67	11	35.6	3.80	6.0
St. Marys	58	13	32.0	3.39	10.8
Saltsburg				2.20	6.4
Selinsgrove	67	18	37.2	1.68	T.
Shawmont				2.82	
Somerset	55	14	32.7	2.63	13.6
South Eaton	63	14	34.6	1.69	1.0
State College	61	17	34 6	2.06	3.8
Sunbury				1.00	
Swarthmore	64	19	37.9	2.70	2.0
Towanda	64	11	34.2	2.43	2.1
Troutrun				4.50	2.3
Uniontown	65	21	37.3	3.74	3.5
Warren	70	12	34.6	5.00	16.0
Wellsboro	66	14	34.2	3.59	T.
Westchester	62	17	39.0	3.14	2.2
West Newton				2.17	T
Westtown	60	17	39.1	2.94	T.
Wilkesbarre	62	15	35.6	1.23	2.0
Williamsport	65	18	36.1	2.59	0.9
York	71	17	37.8	2.50	0.3
Rhode Island.					
Bristol	60	15	38.4	1.77	0 5
Kingston	66	4	35.5	3.04	2.5
Pawtucket	58	16	39.2	2.31	T.
Providence[a]	66	12	38.1	2.24	T.
Providence[c]	66	9	36.6	2.72	T.
South Carolina.					
Allendale	80	28	52.4	0.40	
Anderson	82	22	49.0	0.67	2.0
Barksdale	77	24	48.4	0.55	0.2
Batesburg	80	28	48.2	1.01	T.
Beaufort	82	24	53.8	1.36	
Blackville	85	23	51.6	1.07	
Bowman	82	20	49.2	1.01	T.
Calhoun Falls				0.99	3.0
Camden				0.63	T.
Cheraw[a]	77	18	45.2	0.61	
Cheraw[b]				0.56	
Clemson College	80	18	44.9	0.75	
Conway	82	18	48.0	1.40	T.
Darlington	84	18	46.8	1.48	T.
Due West	77	24	48.0	0.52	1.6
Edisto				0.78	T.
Effingham				1.82	T.
Florence	71[b]	27[b]	46.4[b]	1.20	T.
Gaffney	80	22	45.5	1.41	
Georgetown	81	26	50.8	3.10	T.
Gillisonville	84	20	50.5	0.96	
Greenville	76	19	43.2	0.68	T.
Greenwood	81	22	46.9	0.90	2.0
Kingstree[b]				1.62	T.
Liberty	72	19	44.6	1.03	0.1
Little Mountain	78	25	48 2	1.13	1.0
Longshore	80	23	47.4	1.47	2.5
Lugoff	80	17	48.4	0.57	T.
Pinopolis	75	24	48.2	1.32	T.
St. Stephens				1.19	T.
Santuck	79	16	44.8	0.85	T.
Seivern	82	17	47.1	0.99	T.
Smiths Mills				1.12	T.
Society Hill	75	21	46.5	1.10	
Spartanburg	80	21	46.2	0.96	
Statesburg	80	28	50.0	1.50	0.5
Summerville	78	23	49.6	0.96	
Temperance	85	18	46.7	1.11	
Trenton	77	32	50.8	1.12	T.
Trial	80	18	46.0	1.32	
Walhalla	79	17	44.5	0.36	T.
Winnsboro	83	27	48.1	0.63	T.
Winthrop College	78	24	45.9	1.04	
Yorkville	82	25	48.6	0.89	
South Dakota.					
Aberdeen	64	7	36.9	0.25	
Academy	72	11	37.2	0.09	0.8
Alexandria	76	9	32.8	T.	T.
Armour	73	15	39.7	0.19	0.5
Ashcroft	77	8	36.6	0.23	2.0
Bad Nation	78	8	37.4	0.23	0.5
Bowdle	78	−2	36.4	0.15	1.5
Brookings	68	4	30.2	0.60	3.0
Canton	72	7	35.0	0.95	T.
Centerville				0.89	0.3
Chamberlain	77	11	37.0	0.03	0.7
Clark	72	4	31.3	0.28	2.0
Desmet	68	11	32.2	1.12	10.0
Doland	72	1	31.2	0.35	3.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
South Dakota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Elkpoint	75	10	36.8	0.82	T.
Farmingdale	.....	.....	.....	0.14	1.0
Faulkton	70	5	31.5	0.14	2.0
Flandreau	65	6	30.9	0.90	2.5
Forestburg	74	6	32.6	0.03	0.3
Fort Meade	75	15	39.0	0.17	T.
Gannvalley	74	5	34.4	0.07	0.7
Gary	54	8	27.2	0.35	3.0
Grand River School	70	−6	32.4	0.19	3.0
Greenwood	73	14	39.6	0.48	0.6
Hartman	70	6	33.0	1.06	0.8
Hotch City	77	11	36.7	0.05	0.5
Howard	61	.....	...	0.41	.....
Interior	74	15	40.0	0.09	0.9
Ipswich	68	2	29.0	0.02	0.5
Kimball	70	9	35.2	0.13	1.3
Leola	66	4	28.2	.....	.....
Leslie	78	10	35.4	0.30	.....
Marion	74	10	33.6	T	T.
Mellette	70	4	33.0	0.02	T.
Menno	71	9	34.0	0.60	0.5
Millbank	67	5	29.3	0 40	3.5
Mitchell	74	10	34.8	0.25	T.
Mound City	70	1	31.6	0.05	1.0
Oelrichs	73	15	39.6	0.05	0.5
Pine Ridge	72	11	40.0	0.07	T.
Plankinton	64	9	31.4	0.09	1.0
Redfield	73	3	30.2	0.12	2.0
Rosebud	76	13	40.4	0.04	0.5
St. Lawrence	73	8	35.0	0.04	0.4
Silver City	.....	.....	.....	0.34	3.0
Sioux Falls	55[e]	11[e]	34.6[e]	0.90	T.
Sisseton Agency	65[e]	5[e]	28.8[e]	0.17	1.5
Spearfish	72	18	40.4	0.08	.....
Vermillion	72	12	36.8	1.03	T.
Waubay	55	4	28.4	0.08	0.2
Wentworth	69	7	31.6	0.81	1.0
Wolsey	.....	.....	.....	0.15	1.0
Tennessee.					
Andersonville	71	17	42.6	2.04	
Ashwood	74	15	44.4	0.87	
Benton	77	16	43.6	1.92	
Bluff City	.....	.....	.....	1.10	T.
Bolivar	76	20	44.7	1.72	
Bristol	70	16	37.7	0.97	T.
Byrdstown	70	17	40.4	1.71	T.
Carthage	75	17	44.1	1.87	
Charleston	.....	.....	.....	2.21	
Clarksville	74	16	44.3	1.45	
Clinton	.....	.....	.....	1.17	
Decatur	75	15	43.2	1.79	
Dickson	71	15	43.8	1.57	
Dover	75	15	44.0	1.28	
Elizabethton	74	13	39.7	0.85	T.
Florence	74	16	43.4	1.19	
Franklin	72	16	42.9	1.10	
Grace[*1]	76	20	45.2	1.70	
Greeneville	71	17	40.6	1.23	T.
Harriman	71	19	41.8	1 64	
Hohenwald	73	11	43.4	1.90	
Iron City	77	14	44.6	1.77	
Johnsonville	77	11	44.2	1.42	
Jonesboro[*1]	67	18	39.2	0.78	T.
Kingston	.....	.....	.....	1.33	
Lafayette	.....	.....	.....	1.30	
Lewisburg	75	16	44.4	1.30	
Liberty	77	16	44.4	2.26	
Lynnville	72	17	43.6	0.11	
McKenzie	77	18	45.9	0.95	
Maryville	76	19	42.8	1.50	
Newport	70	20	41.8	1.18	
Nunnelly	73[f]	12[f]	46.4[f]	0.50	
Oakhill	74	14	41.6	2.10	
Palmetto	74	18	45.1	1.41	
Peryear[*b]	74	19	43.6	1.20	
Pope	78	20	44.4	1.45	
Rogersville	71	19	40.8	1.30	T.
Rugby	71	11	38.8	2.25	
Savannah	77	19	46.4	1.48	
Sewanee	.....	17	.....	1.49	
Silverlake	67	13	36.2	0.89	T.
Springdale	73	14	40.4	1.09	T.
Tazewell	.....	.....	.....	1.13	
Tellico Plains	78	17	43.8	1.54	T.
Tracy City	71	12	41.6	2.21	
Trenton	71	17	45.2	1.99	
Tullahoma	75	13	43.2	2.90	
Union City	75	29	48.5	1.80	
Waynesboro	75	14	44.1	1.57	
Wildersville	73	18	45.8	2 05	
Yukon	76	20	46.7	2.82	
Texas.					
Albany	78	32	54.9	1.15	
Alvin	.....	.....	.....	1.79	
Anna	83	25	53.3	1.70	
Anson	.....	.....	.....	0.10	

Stations	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Texas—Cont'd	°	°	°	*Ins.*	*Ins.*
Arthur	.....	.....	.....	2.74	
Austin *a*	83[c]	36[c]	61.7[c]	1.00	
Austin *b*[*5]	82	34	58.7	.....	
Ballinger	81	33	55.3	1.65	
Bastrop	86	34	62.0	0.90	
Beaumont	82	35	59.7	1.22	
Beeville	87	34	63.0	0.69	
Big Spring	.....	.....	.....	1.00	
Blanco	84	29	55.0	1.69	
Boerne[*1]	80	36	59.5	0.75	
Booth	.....	.....	.....	1.14	
Bowie	83	31	56.3	1.15	
Brazoria	84	39	62.2	2.05	
Brenham	83	37	62.6	1.90	
Brighton	85	46	67.1	0.39	
Burnet	84	32	58.1	0.92	
Coleman	83	34	58.0	1.66	
College Station	86[d]	30	54.8	1.95	
Columbia	83	34	59.8	1.25	
Comanche	81	32	56.2	2.70	
Corsicana	81	32	56.6	2.77	
Cotulla	86	39	67.2	0.60	
Cuero	85	38	65.6	1.89	
Danevang	87	33	62.2	1.47	
Dublin	80	33	54.6	1.40	
Duval	82	39	60.2	0.92	
Estelle	81	31	56.6	2.27	
Fort Clark	83	38	62.0	0.98	
Fort McIntosh	91	42	68.1	0.47	
Fort Ringgold	94	48	74.2	0.60	
Fort Stockton	.....	.....	.....	0.00	
Fredericksburg	82	30	59.1	0.83	
Gainesville	81[b]	26[e]	54.7[e]	1.06	
Georgetown	.....	.....	.....	1.22	
Grapevine	86[c]	30[b]	57.9[c]	2.44	
Hale Center	81	31	53.6	3.25	
Hallettsville	84	38	63.8	0.98	
Haskell	86	31	55.3	1.24	
Henrietta	84	31	55.4	1.51	
Hewitt	...	.....	.....	1.50	
Hondo	.....	.....	.....	0.52	
Houston	82	36	60.8	1.65	
Huntsville	83	33	58.8	1.82	
Ira	84	33	55.7	1.50	
Jacksonville	80	29	55.8	3.45	
Jasper	94	32	61.0	3.13	
Kaufman	81	30	56.5	.....	
Kent	.....	.....	.....	0.20	
Kerrville	90	26	58.0	1.01	
Kopperl	.....	.....	.....	2.01	
Lampasas	82	32	57.8	2.60	
Lapara	.....	.....	.....	0.30	
Laureles Ranch	.....	.....	.....	0.57	
Longview	80	31	56.2	4.84	
Luling	85	36	61.4	0.66	
Mann	82	30	58.0	4.70	
Menardville	81	29	55.2	2.54	
Mount Blanco	79	30	52.0	1.15	
Nacogdoches	80	28	55.8	2.59	
New Braunfels	85	34	60.9	0.47	
Panter	.....	.....	.....	0.87	
Port Lavaca	82	41	65 2	0.67	
Rhineland	85	31	55.3	0.98	
Rockisland	83	36	61.4	1.28	
Rockport	85	50	67.9	0.50	
Runge	87	35	62.7	0.84	
Sanderson	86	36	60.5	0.20	
San Marcos	85	33	62.2	0.87	
San Saba	83	30	57.7	2.40	
Santa Gertrudes Ranch	.....	.....	.....	0.49	
Sherman	77	34	55.5	2.13	
Sugarland	84	33	62.9	0.60	
Sulphur Springs	79	31	55.8	2.99	
Temple *a*	82	37	58.6	1.81	
Temple *b*	82	32	57.2	1.62	
Trinity	83	30	60.6	1.92	
Tulia	.....	.....	.....	2.80	
Tyler	76	19	51.7	3.32	
Victoria	.....	.....	.....	0.35	
Waco	81	35	58.8	2.08	
Waxahachie	79	29	56.1	1.95	
Weatherford	81	31	56.3	1.41	
Wichita Falls	.....	...	.....	1.10	
Utah.					
Aneth	74	20	44.9	0.00	
Blackrock	67	11	40.6	T.	
Bluecreek[*1]	70	24	48.6	0.20	
Castledale	66	16	39.6	T.	
Cisco	68	22	42.4	0.00	
Corinne	67	24	43.3	0.28	
Deseret	70	10	40.8	0.04	
Emery	63	14	37.8	T.	
Escalante	65	22	42.6	T.	
Farmington	66	31	46.0	1.20	
Fillmore	76	19	46.0	0.15	
Fort Duchesne	65	17	36.1	0.16	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Utah—Cont'd.	°	°	°	*Ins.*	*Ins.*
Frisco	62	22	44.6	T.	
Giles	70	14	41.1	T.	
Government Creek	62	21	42.2	0.63	
Grover	67	19	41.4	T.	T.
Heber	66	15	39.0	1.40	2.0
Henefer	65	13	38.4	1.05	T.
Huntsville	.....	.....	.....	0.62	
Kelton[*1]	62	23	40.4	0.00	
Levan	66	18	40.3	0.53	T.
Loa	62	0	31.6	0.00	
Logan	63	26	42.0	0.35	
Manti	68	18	40.8	0.50	
Marysvale	70	15	41.2	0.14	
Meadowville	60	18	37.1	0.55	
Millville	.....	.....	.....	0.18	
Minersville	64	21	43.4	0.16	
Moab	71	21	44.2	0.02	
Mount Pleasant	67	20	41.7	0.67	
Ogden[*1]	64	24	43.2	0.36	
Parowan	65	16	41.8	0.03	
Pinto	61	15	38.6	0.39	
Provo	69	21	43.2	0.85	
St. George	76	19	47.5	0.00	
Scipio	66	16	41.8	0.51	T.
Snowville	62	32	45.0	0.00	
Thistle	70	18	40.8	0.93	
Tooele	66	26	43.7	0.89	
Tropic[e]	62	8	35.3	T.	
Vernal	65	16	38.4	0.27	
Wellington	68	11	38.0	0.00	
Woodruff	60	10	33.3	0.19	T.
Vermont.					
Bennington	65	9	32.5	2.15	14.0
Burlington	61	9	33.0	1.84	7.5
Chelsea	53	− 5	26.9	1.53	9.0
Cornwall	67	0	31.8	2.93	11.0
Enosburg Falls	63	− 1	27.5	5.71	51.0
Hartland	59	1	29.4	1.55	3.1
Jacksonville	69	4	28.2	1.49	6.3
Manchester	58	3	29.8	2.84	3.8
Norwich	58	− 2	28.9	1.63	6.0
St. Johnsbury	59	1	28.6	1.60	9.5
Vernon[*6]	58	0	31.3	1.22	T.
Wells	56	4	29.2	2.02	8.5
Woodstock	56	− 4	30.0	1.47	6.0
Virginia.					
Alexandria	69	22	41.1	1.89	0.3
Ashland	77	16	42.6	1.40	
Barboursville	84	21	44.6	2.37	T.
Bedford	77	20	42.2	1.34	
Bigstone Gap	71	16	38.8	1.21	T.
Birdsnest[2]	.....	.....	41.1	1.70	T.
Blacksburg	71	11	36.4	1.02	0.6
Bon Air	78	18	43.2	1.71	
Buckingham	82	27	45.0	0.30	
Burkes Garden	62	11	34.0	0.97	1.0
Callaville	74	15	41.6	1.10	
Charlottesville	76	22	42.8	2.17	T.
Clifton Forge	66	19	40.8	0.76	0.2
Columbia	80	15	40.8	1.90	
Dale Enterprise	75	14	38.8	1.39	0.2
Farmville	76	15	41.4	1.40	
Fredericksburg	74	19	40.8	1.58	T.
Grahams Forge	64	14	37.2	1.23	T.
Hampton	70	23	46.1	0.63	
Hot Springs	64	14	34.6	2.35	T.
Lexington	67[b]	16[b]	37.2[b]	1.32	0.2
Lincoln	69	16	39.8	2.63	T.
Newport News	75[e]	28	48.4	0.20	
Petersburg	78	18	42.8	2.48	
Quantico	73	23	41.0	.....	
Radford	.....	.....	.....	0.99	
Riverton	.....	.....	.....	3.16	
Salem	.....	.....	.....	1.07	
Speers Ferry	.....	.....	.....	1.23	T.
Spottsville	78	17	45.2	0.86	
Staunton	74	18	40.0	1.40	T.
Stephens City	70[e]	18[e]	38.9[e]	2.72	0.2
Warsaw	68	17	39.2	2.52	T.
Westpoint	79	16	40.5	1.00	
Williamsburg	73	.....	.....	0.68	
Woodstock	69	18	39.8	2.07	T.
Wytheville	70	17	38.7	1.00	0.5
Washington.					
Aberdeen	60	35	46.4	19.09	
Anacortes	.....	.....	.....	5.14	
Ashford	.....	.....	.....	9.53	
Bremerton	74	35	48.3	10.15	
Brinnon	60	34	46.8	16.18	
Buchanan's Farm	.....	.....	.....	1.16	
Cedonia	52	19	36.6	1.85	4.0
Cheney	.....	.....	.....	3.11	4.0
Clearwater	58	33	47.8	23.68	
Cle Elum	65	26	39.0	5.31	
Colfax	68	23	43.0	2.96	0.5
Colville	58	17	37.4	2.46	2.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Washington—Cont'd.	°	°	°	*Ins.*	*Ins.*
Conconully	55	18	36.3	1.93	2.5
Connell	.....	.....	.....	0.35	
Coupeville	66	35	47.3	3.08	
Crescent	57	21	38.0	1.51	2.5
East Sound[1]	66	30	46.2	5.68	
Ellensburg	68	18	38.6	2.30	
Ellensburg (near)	66	18	37.6	2.29	
Grandmound	60	33	47.1	8.68	
Granite Falls	.....	.....	.....	6.32[b]	
Hooper	68	22	43.8	1.14	
Ilwaco	64	36	50.8	15.97	
Issaquah	.....	.....	.....	7.73	
Lacenter	65	31	46.5	8.27	
Lakeside	58	28	41.2	2.42	2.0
Lind	60	12	40.2	0.85	0.5
Mayfield	61	30	45.9	12.03	
Mottinger Ranch	77	28	45.7	0.56	
Mount Pleasant	57	34	44.5	7.37	
Moxee Valley	69	13	40.2	1.43	
Northport	60	24	41.6	1.72	5.0
Olga	64	36	48.1	6.72	
Olympia	61	33	47.2	11.52	
Pasco	67	18	45.0	0.38	
Pinehill	69	28	44.9	3.84	
Pomeroy	68	22	45.6	2.92	
Port Townsend	62	37	49.0	2.67	
Renton	.....	.....	.....	7.23	
Ritzville	.....	.....	.....	0.49	
Rosalia	63	22	41.4	3.42	3.5
Sedro	68	31	47.3	8.26	
Silvana	66	29	47.6	3.40	
Snohomish	64	32	45.9	5.90	
Snoqualmie	65	32	47.4	9.10	
Southbend	65	33	49.2	15.06	
Sprague	.....	.....	.....	3.10	
Stampede	.....	.....	.....	12.60	7.0
Sunnyside	67	19	41.6	0.46	
Twin	65	32	46.3	15.66	
Union	64	30	46.5	17.80	
Usk	51	14	36.1	1.74	2.6
Vancouver	63	33	48.0	6.74	
Vashon	61	34	47.1	8.90	
Waterville	55	16	34.8	2.33	6.0
Wenatchee (near)	54	24	37.7	2.93	4.0
Whatcom	70	32	49.0	5.91	
Wilbur	58	9	36.8	1.67	1.0
West Virginia.					
Beckley	66	11	33.6	.....	.....
Beverly	70	7	34.7	3.31	14.0
Bluefield	69	20	37.2	1.55	4.5
Buckhannon	70	14	35.1	2.89	10.0
Burlington	69	13	37.7	2.30	2.0
Byrne	78	15	37.6	4.50	10.0
Camden	67	17	35.8	3.40	7.0
Central[c]	73	15	37.4	2.81	4.0
Charleston	.....	.....	.....	2.23	0.6
Creston	79	18	43.4	2.60	1.2
Dayton	71	14	36.8	2.96	5.2
Elkhorn	71	19	40.2	1.27	2.4
Fairmont	.....	.....	.....	3.23	2.5
Glenville	75	11	37.0	3.48	2.9
Grafton	73	15	35.4	3.12	5.0
Green Sulphur	68	17	34.4	1.54	
Harpers Ferry	.....	.....	.....	3.70	T.
Hinton *a*	.....	.....	.....	1.40	1.5
Hinton *b*	68[b]	17[b]	40.6[b]	.....	.....
Huntington	74	18	38.6	2.26	T.
Josiah	74	19	37.8	2.53	2.0
Lewisburg	65	14	35.4	1.23	0.2
Logan	74	20	41.6	2.40	T.
Magnolia	67	12	37.2	2.60	
Mannington	79	18	38.1	5.35	3.2
Martinsburg	66	17	37.6	3.72	0.2
Morgantown	72[f]	19[f]	36.5[f]	3.02	3.5
Moscow	69	20	38.4	1.75	1.5
Moundsville	78	21	41.0	1.62	1.5
New Martinsville	75	20	39.9	2.76	2.5
Nuttallburg	69	15	36.2	2.23	6.0
Oceana	70	17	38.8	2.03	
Oldfields	74	15	41.6	2.05	T.
Parsons	73	10	36.0	1.75	9.0
Philippi *a*	.....	.....	.....	3.07	11.0
Point Pleasant	72	21	41.8	2.57	T.
Powellton	73	20	39.6	2.31	0.5
Romney	70	13	38.1	2.95	T.
Rowlesburg	.....	.....	.....	3.60	10.7
Southside	75	21	41.5	2.36	1.0
Spencer	75	12	39.5	3.13	2.5
Terra Alta	64	10	36.6	2.55	15.5
Uppertract	71	14	38.0	1.55	7.1
Wellsburg	67	18	35.8	1.94	2.0
Weston *a*	.....	.....	.....	3.19	3.7
Weston *b*	71	17	38.0	.....	.....
Wheeling *a*	.....	.....	.....	1.71	2.3
Wheeling *b*	69	24	42.0	1.76	.....
Williamson	75	20	42.3	1.24	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Wisconsin.	°	°	°	*Ins.*	*Ins.*
Amherst	62	5	29.2	0.78	4.0
Antigo	64	3	29.2	1.40	3.0
Appleton	.....	14	.....	0.44	1.5
Ashland	.....	.....	.....	1.42	7.7
Beloit	64	14	34.4	1.17	.....
Brodhead	67	11	34.8	0.83	2.5
Butternut	61	− 1	25.6	0.60	7.5
Chilton	64	11	31.6	0.66	.....
Darlington	64	4	32.2	0.88	T
Delavan	65	13	34.4	.....	.....
Easton	64	2	30.3	0.80	2.0
Eau Claire	60	10	28.9	0.54	2.5
Florence	57	7[c]	28.3	1.79	7.5
Fond du Lac	63	13	34.2	0.73	T.
Grand River Locks	.....	.....	.....	1.10	3.0
Grantsburg	54	4	29.8	0.88	1.5
Hartland	65	10	33.5	0.74	0.8
Harvey	67	14	33.5	0.78	2.8
Hayward	61	5	28.4	0.57	2.7
Hillsboro	63	5	31.4	1.03	7.0
Knapp	54	5	29.6	.....	.....
Koepenick	60	0	27.6	1.70	9.0
Ladysmith	63	6	29.0	.....	.....
Lancaster	65	7	32.3	1.29	4.0
Madison	63	12	33.6	0.46	0.1
Manitowoc	63	16	34.0	0.62	T.
Meadow Valley	65	11	30.4	0.62	4.0
Medford	63	12	29.0	0.70	2.0
Menasha	.....	.....	.....	0.55	0.5
New Holstein	65[d]	14[d]	33.8[d]	0.43	
New London	63	11	31.6	0.74	3.0
North Crandon	58	− 8	26.0	1.26	5.3
Oconto	62	10	33.2	1.81	1.5
Osceola	55	1	27.4	1.87	2.0
Oshkosh	70[e]	18[e]	35.4[d]	0.80	
Pepin	60	16	34.8	0.63	3.0
Pine River	63	7	31.3	0.35	3.3
Portage	65	12	34.2	0.79	4.0
Port Washington	70	11	34.1	0.85	2.0
Prairie du Chien *a*	73	8	36.1	0.60	4.2
Prairie du Chien *b*	.....	.....	.....	0.50	3.5
Prentice	62	4	29.3	0.22	0.2
Sheboygan	64	17	35.6	0.59	T.
Stevens Point	66	4	31.8	0.50	4.0
Valley Junction	70	10	33.4	1.10	3.0
Viroqua	64	6	31.8	0.90	5.0
Watertown	64	11	32.0	0.91	1.7
Waukesha	64	14	34.1	0.58	0.1
Waupaca	62	8	31.7	0.94	4.2
Wausau	59	8	30.6	1.47	
Wausaukee	58	6	31.0	1.06	T.
Westbend	69	11	36.2	.....	.....
Westfield	63	8	31.3	0.35	1.0
Whitehall	64	13	32.7	0.66	4.0
Wyoming.					
Alcova	68	20	41.4	0.50	4.0
Basin	.....	.....	.....	0.17	
Bedford	62	14	35.3	0.98	2.5
Bigpiney[1]	53	− 8	25.6	T.	T.
Bitter Creek	82	5	44.8	0.20	2.0
Buffalo	74	11	39.4	0.24	4.0
Casper	67	12	39.7	0.77	4.5
Centennial	57	7	32.0	0.23	T.
Chugwater	72	3	40.4	0.05	0.5
Daniel	57	2	29.3	T.	
Embar	69	11	37.8	0.75	8.5
Evanston	58	7	34.5	0.75	1.0
Fort Laramie	75	8	37.4	0.16	0.5
Fort Washakie	66	9	35.4	0.21	2.0
Fort Yellowstone	51	11	34.6	1.25	8.0
Fourbear	63	10	36.0	0.29	7.5
Griggs	71	4	40.5	0.87	9.1
Hyattville	65	15	39.6	0.00	
Iron Mountain	66	8	39.0	0.17	.....
Laramie	62	11	37.1	T.	T.
Lusk	65	10	36.4	0.08	0.8
Moore	70	13	42.0	0.20	2.4
Parkman	75	13	40.0	0.33	4.2
Pinebluff	71	10	41.2	T.	T.
Rawlins	58	13	34.1	0.25	
Rocksprings	64	7	35.8	0.03	T.
Saratoga	63	12	36.8	T.	T.
Sheridan	75	9	38.0	0.55	5.5
South Pass City	53	2	27.0	0.20	2.0
Thayne	58	15	34.5	0.99	2.1
Thermopolis	64	9	36.6	0.16	
Cuba.					
Aguacate	88	40	70.2	0.26	
Alvarez	.....	.....	.....	0.00	
Australia	89	46	69.5	0.00	
Banaguises	88	57	70.7	T.	
Batabano	88	51	69.6	0.00	
Camajuani[b]	89	45	72.0	0.26	
Ciego de Avila	.....	.....	.....	0.10	
Cruces	.....	.....	.....	0.00	
Gibara	86	58	73.2	8.25	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Cuba—Cont'd.	°	°	°	*Ins.*	*Ins.*
Guabairo	.....	.....	.....	0.00	
Guanajay	82	56	69.6	0.60	
Guantanamo	92	57	76.0	1.98	
Guines	92	58	73.8	0.00	
Holguin[2]	89	57	74.6	1.21	
Los Canos	92	55	76.4	0.70	
Luisa, Guantanamo	.....	.....	.....	1.79	
Magdalena[3]	86	49	68.6	0.00	
Manzanillo	89	69	78.6	T.	
Moron Trocha	92	65	78.4	0.26	
Pinar del Rio	87	52	70.9	0.25	
Romelle, Guantanamo	.....	.....	.....	0.68	
San Cayetano	95	50	70.6	0.00	
Sancti Spiritus	82	54	69.2	0.93	
San Emelio, Guanta'mo	.....	.....	.....	1.40	
Santa Clara	82	42	66.3	T.	
San Vicente	.....	.....	.....	2.14	
Soledad	85	48	67.6	0.00	
Soledad, Guantanamo	91	58	76.0	1.66	
Yaguajay	86	54	71.0	0.80	
Yateras	.....	.....	.....	1.27	
Porto Rico.					
Adjuntas	86	55	71.4	17.83	
Aguadilla	87	69	78.2	11.17	
Aguirre	89	67	78.8	6.18	
Arecibo	90	66	76.8	16.36	
Barros	90	56	73.6	21.57	
Bayamon	94	65	78.8	12.40	
Caguas	87	62	75.4	11.77	
Canovanas	89	70	78.2	10.65	
Cayey	96	58	76.0	15.63	
Cidra	87	60	75.2	10.70	
Coamo	.....	.....	.....	8.80	
Corozal	92	60	75.6	14.98	
Fajardo	90	68	79.6	14.87	
Guayamo	.....	.....	.....	4.11	
Hacienda Amistad	92	61	76.2	13.97	
Hacienda Coloso	89	62	76.2	14.02	
Hacienda Perla	90	70	78.6	18.30	
Humacao	88	62	74.0	15.60	
Isabela	89	67	78.0	14.57	
Juan Diaz	91	66	78.8	10.75	
La Isolina	87	62	74.2	16.17	
Las Marias	94	65	77.5	17.59	
Manati	92	64	77.8	16.90	
Maunabo	87	71	80.0	13.84	
Mayaguez	91	64	77.6	12.84	
San German	.....	.....	.....	18.95	
San Lorenzo	91	62	77.5	10.80	
San Salvador	86	61	73.8	12.38	
Santa Isabel	92	67	79.0	8.16	
Utuado	91	63	76.2	15.20	
Yauco	86	64	76.6	7.52	
Mexico.					
Ciudad P. Diaz	84	38	63.6	0.66	
Coatzacoalcos	86	59	73.8	13.32	
Leon de Aldamas	78	35	59.2	0.86	
Pueblo	73	43	59.1	1.02	
Vera Cruz	86	63	75.4	2.44	
New Brunswick.					
St. John	57	13	35.0	3.50	1.9
Isthmus of Panama.					
Alhajuela	88	69	75.7	21.50	
La Boca	86	74	79.2	14.65	

Late reports for October, 1901.

Alaska.	°	°	°	*Ins.*	*Ins.*
Fort Liscum	53	18	36.4	10.31	
Juneau	57	23	44.6	16.50	
Orca	54	28	41.2[c]	24.71	
Arizona.					
Duncan	92	31	60.6	2.20	
California.					
Fort Tejon	.....	.....	.....	1.61	
Glendora	.....	.....	.....	2.19	
Goshen[*5]	92	40	68.6	0.40	
Jolon	.....	.....	.....	1.16	
Las Fuentes Ranch	.....	.....	.....	2.51	
Lemoore[*1]	90	40	69.8	0.30	
Mutah	.....	.....	.....	2.93	
Ogilby[*1]	102	70	87.8	T.	
San Miguel Island	92	50	61.3	2.98	
Snedden	.....	.....	.....	1.75	
Stanford University	89	32	61.2	.....	
Templeton[*1]	98	40	57.8	1.70	
Upper Mattole[*1]	92	41	57.8	2.92	
Westpoint	.....	.....	.....	2.78	
Yuba City[*5]	93	47	67.4	2.17	
Colorado.					
Fort Collins	82	35	49.8	0.36	
Glenwood Springs	.....	.....	.....	0.36	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Colorado—Cont'd.	°	°	°	*Ins.*	*Ins.*
Parachute	85	30	53.5	1.40	
Rangely	83	19	49.5	0.86	
Idaho.					
Riddle	81	26	49.2	1.60	
Illinois.					
St. Charles[*5]	83	29	53.4	1.37	
Iowa.					
Larrabee	80	28	51.3	1.75	T.
Louisiana.					
Reserve	82	46	67.8	3.04	
Massachusetts.					
Webster	.....	.....	.....	3.02	
Michigan.					
Hart	68	25	47.2	3.48	
Missouri.					
Olden	89	31	62.6	0.98	
Nebraska.					
Burchard	.....	.....	.....	4.78	
Seneca[*1]	76	32	48.5	.....	
New Hampshire.					
Littleton	69	23	46.1	2.98	2.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
North Carolina.	°	°	°	*Ins.*	*Ins.*
Abshers	86	25	58.0	2.04	
North Dakota.					
Falconer	83	20	49.8	1.15	
Ohio.					
Sinking Spring	80	28	53.2	.....	
Oregon.					
Arlington	80	48	64.4	0.00	
Westfork[*1]	74	44	60.0	2.23	
Pennsylvania.					
California	.....	32	.....	0.56	T.
South Dakota.					
Ashcroft	.....	.....	.....	0.00	
Texas.					
Anson	.....	.....	.....	1.45	
Cotulla	99	39	78.8	0.00	
Tulia	.....	.....	.....	1.05	
Utah.					
Green River	92	29	57.0	0.18	
Wyoming.					
Embar	73	27	50.6	T.	

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. + 4.
[2] Mean of 8 a. m. + 8 p. m. + 2.
[3] Mean of 7 a. m. + 7 p. m. + 2.
[4] Mean of 6 a. m. + 6 p. m. + 2.
[5] Mean of 7 a. m. + 2 p. m. + 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.
[7] Mean from hourly readings of thermograph.
[9] Mean of sunrise and noon.
[10] Mean of sunrise, noon, sunset, and midnight.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance "a" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

September, 1901, Virginia, Rockymount, should read Salem. October, 1901, Washington, Wenatchee (near), make mean temperature 55.6 instead of 55.2.

TABLE III.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of November, 1901.*

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	34	6	10	25	n. 28 w.	32
Portland, Me	30	10	3	31	n. 54 w.	34
Northfield, Vt	30	24	4	7	n 27 w.	7
Boston, Mass	27	6	4	36	n. 56 w.	38
Nantucket, Mass	30	5	6	33	n 47 w.	37
Block Island, R. I	32	6	7	35	n. 47 w.	38
New Haven, Conn	35	6	1	32	n. 47 w.	42
Middle Atlantic States.						
Albany, N. Y	25	16	8	25	n. 62 w.	19
Binghamton, N. Y †	11	4	8	16	n. 49 w.	11
New York, N. Y	31	7	4	37	n. 54 w.	41
Harrisburg, Pa †	11	2	5	18	n. 55 w.	16
Philadelphia, Pa	32	7	5	31	n. 46 w.	36
Scranton, Pa	34	10	10	28	n. 37 w.	30
Atlantic City, N. J	27	4	5	37	n 54 w.	39
Cape May, N. J	33	5	3	32	n. 42 w.	43
Baltimore, Md	18	10	5	38	n. 76 w.	34
Washington, D. C	26	8	4	32	n. 57 w.	33
Lynchburg, Va	27	10	8	31	n. 54 w.	29
Norfolk, Va	29	11	8	24	n. 42 w.	24
Richmond, Va	32	12	8	18	n. 27 w.	22
South Atlantic States.						
Charlotte, N. C	28	13	13	18	n. 18 w.	16
Hatteras, N. C	38	5	4	25	n. 33 w.	39
Raleigh, N. C	31	10	5	28	n 48 w.	31
Wilmington, N. C	31	6	10	25	n. 31 w.	29
Charleston, S. C	32	7	12	19	n 16 w.	26
Columbia, S. C	31	8	12	25	n. 29 w.	26
Augusta, Ga	28	5	10	29	n. 40 w.	30
Savannah, Ga	32	6	9	22	n. 27 w.	29
Jacksonville, Fla	34	4	13	21	n. 15 w.	31
Florida Peninsula.						
Jupiter, Fla	28	6	9	32	n. 46 w.	32
Key West, Fla	43	3	27	5	n. 29 e.	46
Tampa, Fla	40	4	9	20	n. 17 w.	38
Eastern Gulf States.						
Atlanta, Ga	31	8	13	27	n 31 w.	27
Macon, Ga †	18	3	3	13	n 34 w.	18
Pensacola, Fla †	23	0	10	5	n. 12 e.	24
Mobile, Ala	38	12	7	13	n. 13 w.	27
Montgomery, Ala	31	8	13	20	n. 17 w.	24
Meridian, Miss	17	7	7	10	n. 17 w.	10
Vicksburg, Miss	23	15	28	7	n. 69 e.	24
New Orleans, La	28	16	26	9	n. 55 e.	21
Western Gulf States.						
Shreveport, La	19	21	22	12	s. 79 e.	10
Fort Smith, Ark	18	17	26	14	n. 85 e.	12
Little Rock, Ark	22	20	10	24	n. 82 w.	14
Corpus Christi, Tex	22	20	27	3	n. 83 e.	24
Fort Worth, Tex	17	26	15	14	s. 6 e.	9
Galveston, Tex	20	23	26	4	s. 82 e.	22
Palestine, Tex	18	23	22	6	s. 73 e.	17
San Antonio, Tex	20	21	30	3	s. 88 e.	27
Ohio Valley and Tennessee.						
Chattanooga, Tenn	23	13	13	28	n. 56 w.	18
Knoxville, Tenn	28	13	12	21	n. 31 w.	18
Memphis, Tenn	26	21	14	11	n. 31 e.	6
Nashville, Tenn	22	17	15	21	n. 50 w.	8
Lexington, Ky †	9	9	10	10	.....	.....
Louisville, Ky	16	18	15	24	s. 77 w.	9
Evansville, Ind †	12	8	7	10	n. 87 w.	5
Indianapolis, Ind	20	17	11	27	n. 79 w.	16
Cincinnati, Ohio	22	16	13	26	n. 65 w.	14
Columbus, Ohio	18	14	8	34	n. 81 w.	26
Pittsburg, Pa	25	13	5	37	n. 69 w.	34
Parkersburg, W. Va	20	19	11	26	n. 86 w.	15
Elkins, W. Va	22	9	3	35	n. 68 w.	34
Lower Lake Region.						
Buffalo, N. Y	19	10	8	33	n. 70 w.	27
Oswego, N. Y	25	22	9	19	n. 73 w.	10
Rochester, N. Y	13	18	4	37	s. 81 w.	33
Erie, Pa	29	15	5	26	n. 56 w.	25
Cleveland, Ohio	15	26	10	29	s. 60 w.	22
Sandusky, Ohio	16	15	5	37	n. 88 w.	32
Toledo, Ohio	15	14	5	37	n. 88 w.	32
Detroit, Mich	21	12	5	35	n. 73 w.	31
Upper Lake Region.						
Alpena, Mich	19	12	3	37	n. 78 w.	35
Escanaba, Mich	20	18	5	36	n. 87 w.	31
Grand Haven, Mich	21	16	15	25	n. 63 w.	11
Houghton, Mich. †	15	6	6	8	n. 13 w.	9
Marquette, Mich	19	16	4	35	n. 84 w.	31
Port Huron, Mich	24	15	3	34	n. 74 w.	32
Sault Ste. Marie, Mich	19	19	19	22	w.	3
Chicago, Ill	21	18	8	28	n. 81 w.	20
Milwaukee, Wis	13	14	5	37	s. 88 w.	32
Green Bay, Wis	25	21	6	20	n. 74 w.	15
Duluth, Minn	20	19	6	35	n. 88 w.	29
North Dakota.						
Moorhead, Minn	22	22	12	22	w.	10
Bismarck, N. Dak	24	13	21	17	n. 20 e.	12
Williston, N. Dak	16	23	13	24	n. 58 w.	13
Upper Mississippi Valley.						
St. Paul, Minn	22	22	6	20	w.	14
Upper Mississippi Valley—Cont'd.						
La Crosse, Wis †	12	13	5	6	s. 45 w.	1
Davenport, Iowa	17	16	11	27	n. 87 w.	16
Des Moines, Iowa	27	17	11	22	n. 66 w.	24
Dubuque, Iowa	20	19	13	27	n. 86 w.	14
Keokuk, Iowa	22	19	13	21	n. 69 w.	8
Cairo, Ill	25	21	14	14	n.	4
Springfield, Ill	22	18	10	24	n. 74 w.	15
Hannibal, Mo †	10	6	6	13	n. 60 w.	8
St. Louis, Mo	23	22	9	17	n. 83 w.	8
Missouri Valley.						
Columbia, Mo*	8	11	7	11	s. 53 w.	5
Kansas City, Mo	24	19	14	17	n. 31 w.	6
Springfield, Mo	21	21	15	20	w.	5
Lincoln, Nebr	22	18	15	14	n. 14 e.	4
Omaha, Nebr	22	19	13	18	n. 59 w.	6
Valentine, Nebr	16	15	10	29	n. 87 w.	19
Sioux City, Iowa †	12	11	7	8	n. 45 w.	1
Pierre, S. Dak	20	16	22	12	n. 68 e.	11
Huron, S. Dak	20	19	21	18	n. 72 e.	3
Yankton, S. Dak †	.....	.....	.....	.....	.....	.....
Northern Slope.						
Havre, Mont	18	13	17	28	n. 66 w.	12
Miles City, Mont	13	26	13	19	s. 25 w.	14
Helena, Mont	6	30	4	38	n. 55 w.	42
Kalispell, Mont	5	17	6	33	s. 66 w.	30
Rapid City, S. Dak	18	11	10	33	n. 73 w.	24
Cheyenne, Wyo	21	11	1	41	n. 76 w.	41
Lander, Wyo	10	27	12	25	s. 38 w.	22
North Platte, Nebr	11	22	12	27	s. 54 w.	19
Middle Slope.						
Denver, Colo	13	25	13	22	s. 37 w.	15
Pueblo, Colo	19	9	21	23	n. 11 w.	12
Concordia, Kans	16	26	10	15	s. 27 w.	11
Dodge, Kans	21	21	17	19	w.	2
Wichita, Kans	17	32	15	8	s. 25 e.	17
Oklahoma, Okla	22	27	13	9	s. 39 e.	6
Southern Slope.						
Abilene, Tex	18	29	14	9	s. 24 e.	12
Amarillo, Tex	14	27	16	22	s. 25 w.	14
Southern Plateau.						
El Paso, Tex	26	5	23	28	n. 13 w.	
Santa Fe, N. Mex	23	18	28	7	n. 77 e.	
Flagstaff, Ariz	12	16	22	20	s. 27 e.	
Phoenix, Ariz	11	12	31	14	s. 87 e.	
Yuma, Ariz	30	4	25	9	n. 33 e.	50
Independence, Cal	21	22	9	25	s. 86 w.	14
Middle Plateau.						
Carson City, Nev	12	26	16	22	s. 23 w.	15
Winnemucca, Nev	18	19	20	19	s. 45 e.	1
Modena, Utah	10	16	11	38	s. 78 w.	28
Salt Lake City, Utah	22	15	27	19	n. 49 e.	11
Grand Junction, Colo	10	22	17	27	s. 40 w.	16
Northern Plateau.						
Baker City, Oreg	7	36	27	9	s. 32 e.	34
Boise, Idaho	20	16	19	20	n 14 w.	4
Lewiston, Idaho †	3	11	14	9	s. 32 e.	9
Pocatello, Idaho	4	35	19	20	s. 2 w.	31
Spokane, Wash	11	27	25	9	s. 45 e.	23
Walla Walla, Wash	5	41	9	15	s. 10 w.	36
North Pacific Coast Region.						
Neah Bay, Wash	0	19	32	17	s. 38 e.	24
Port Crescent, Wash *	2	13	8	14	s. 27 w.	12
Seattle, Wash	3	39	27	7	s. 29 e.	41
Tacoma, Wash	10	36	6	26	s. 38 w.	33
Astoria, Oreg	13	22	23	19	s. 24 e.	10
Portland, Oreg	8	21	14	19	s. 21 w.	14
Roseburg, Oreg	14	18	19	19	s.	4
Middle Pacific Coast Region.						
Eureka, Cal	13	27	20	15	s. 20 e.	15
Mount Tamalpais, Cal	16	23	18	21	s. 23 w.	8
Red Bluff, Cal	26	20	20	4	n. 69 e.	17
Sacramento, Cal	16	22	28	7	s. 74 e.	22
San Francisco, Cal	9	25	13	25	s. 37 w.	20
South Pacific Coast Region.						
Fresno, Cal	29	8	20	21	n. 3 w.	21
Los Angeles, Cal	19	2	14	32	n. 47 w.	25
San Diego, Cal	36	4	12	23	n. 19 w.	34
San Luis Obispo, Cal	37	12	3	14	n. 24 w.	27
West Indies.						
Basseterre, St. Kitts Island	19	5	42	4	n. 70 e.	40
Bridgetown, Barbados	4	10	55	0	s. 85 e.	55
Cienfuegos, Cuba	39	1	41	1	n. 46 e.	55
Grand Turk †	14	3	17	4	n. 50 e.	17
Havana, Cuba	30	2	34	3	n. 48 e.	42
Kingston, Jamaica	52	0	17	0	n. 20 e.	55
Port of Spain, Trinidad	24	10	40	5	n. 68 e.	38
Puerto Principe, Cuba	48	0	27	0	n. 29 e.	55
Roseau, Dominica, W. I	21	9	30	2	n. 67 e.	30
San Juan, Porto Rico	6	27	31	10	s. 45 e.	30
Santiago de Cuba, Cuba	53	1	5	8	n. 3 w.	52
Santo Domingo, W. I	52	2	9	3	n. 7 e.	50
Willemstad, Curaçao	17	3	44	5	n. 70 e.	41

* From observations at 8 p. m. only.

† From observations at 8 a. m. only.

TABLE IV.—*Thunderstorms and auroras, November*, 1901.

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	32	T.	....	....	2	....	..	....	...	....	....	....	....	....	....	...	....	....	...	4	1	....	....	1	1	....	....	....	....	....	....	....	....	9	5	T
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Arizona	56	T.	....	....	....	....	....	...	....	....	....	....	...	6	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7	2	T.
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Arkansas	57	T.	....	6	3	....	....	....	....	....	4	....	2	4	....	....	....	...	....	4	....	1	2	8	1	2	....	1	1	....	....	....	....	39	13	T.
		A.	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	..	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
California	167	T.	..	....	....	....	....	....	....	....	2	1	....	....	....	....	....	..	..	....	....	1	...	....	....	....	....	....	1	4	5	....	....	14	6	T.
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Colorado	81	T.	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	4	3	T.
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Connecticut	21	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
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Delaware	5	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	..	....	....	....	....	0	0	T.
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Dist. of Columbia	4	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
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Florida	47	T.	1	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	3	3	T.
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Georgia	55	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
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Idaho	34	T.	2	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4	2	T.
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Illinois	92	T.	....	....	1	....	....	....	....	....	....	....	17	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	19	3	T.
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Indiana	58	T.	....	....	....	....	....	....	....	....	....	....	6	....	....	..	....	....	....	....	1	....	1	....	....	....	....	....	....	....	....	....	....	8	3	T.
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Indian Territory	11	T.	....	3	1	....	....	1	....	1	....	....	2	2	....	....	....	....	....	....	....	....	2	4	....	....	....	....	....	1	....	....	....	17	9	T.
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Iowa	149	T.	....	3	....	....	....	1	....	....	....	....	1	.	..	....	....	....	..	....	....	....	....	1	1	....	....	....	....	....	....	....	....	7	5	T.
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Kansas	77	T.	....	11	1	1	....	....	....	....	....	....	2	....	....	....	....	....	....	1	....	....	....	1	....	....	....	....	....	....	....	....	....	17	6	T.
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Kentucky	41	T.	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	T.
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Louisiana	46	T.	....	....	6	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	14	....	....	....	....	....	....	....	1	....	22	4	T.
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Maine	19	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
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Maryland	48	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
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Massachusetts	48	T.	....	....	....	....	....	....	....	....	....	....	...	....	....	....	....	....	....	....	....	....	....	.	....	....	....	....	....	....	....	....	....	0	0	T.
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Michigan	106	T.	....	....	....	....	....	....	....	....	....	....	11	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	11	1	T.
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Minnesota	67	T.	...	5	1	1	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7	3	T.
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Mississippi	44	T.	...	....	7	....	....	....	....	....	....	....	...	2	....	....	....	....	....	5	2	....	....	8	....	.	1	....	....	....	....	....	....	25	6	T.
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Missouri	95	T.	1	3	2	....	....	....	....	....	....	1	7	3	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	18	7	T.
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Montana	40	T.	....	....	....	....	7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	8	2	T.
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Nebraska	142	T.	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	1	1	....	....	....	....	....	7	2	T.
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Nevada	40	T.	....	....	....	....	....	....	....	....	....	2	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	1	T.
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New Hampshire	19	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
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New Jersey	51	T.	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	T.
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New Mexico	41	T.	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	1	T.
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New York	99	T.	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	T.
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North Carolina	56	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	4	1	T.
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North Dakota	48	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	1	....	3	3	A.
Ohio	128	T.	....	....	....	....	....	....	....	....	....	....	15	....	....	....	....	1	1	1	....	....	....	1	....	....	....	....	....	....	....	....	....	19	5	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Oklahoma	23	T.	1	5	....	....	....	..	....	....	....	....	4	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	12	4	T.
		A.	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Oregon	74	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	2	....	....	2	....	....	2	....	....	....	1	....	....	....	....	9	6	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Pennsylvania	91	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Rhode Island	7	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
South Carolina	46	T.	....	....	....	....	....	..	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	3	....	....	....	....	....	....	....	....	5	2	T.
		A.	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
South Dakota	56	T.	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	T.
		A.	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	4	2	A.
Tennessee	56	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Texas	95	T.	2	5	3	1	....	....	....	....	2	....	....	1	1	..	....	....	....	1	....	....	....	6	1	1	....	....	....	....	....	....	....	24	11	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Utah	47	T.	...	....	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4	1	T.
		A.	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Vermont	16	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Virginia	50	T.	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Washington	64	T.	....	....	....	....	5	....	2	....	....	....	....	....	....	1	4	1	....	....	....	1	....	....	2	....	..	....	....	....	....	....	....	16	7	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
West Virginia	43	T.	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Wisconsin	60	T.	....	....	....	....	....	....	....	....	....	....	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	5	1	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Wyoming	31	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Sums	2,698	T.	8	50	27	4	15	2	2	1	8	8	74	21	3	2	5	3	4	17	4	5	8	45	17	3	1	1	3	5	1	2	....	353	....	T
		A.	0	2	4	2	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	2	1	1	0	0	2	3	1	1	1	3	....	26	....	A.

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during November, 1901, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration.		Total amt of precipitation.	Excessive rate.		Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated.													
		From—	To—		Began—	Ended—		5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y.	11-12			1.25														0.17			
Alpena, Mich.	11			0.31														*			
Atlanta, Ga.	4			0.26														0.13			
Atlantic City, N. J.	23-24			2.05														0.45			
Baltimore, Md.	23-24			1.91														0.24			
Binghamton, N. Y.	11-12			1.00														0.09			
Bismarck, N. Dak.	6			0.30														*			
Boise, Idaho	10			0.05														0.04			
Boston, Mass.	24-25			1.92														0.23			
Buffalo, N. Y.	11-12			0.84														0.19			
Cairo, Ill.	3			1.17														0.66			
Charleston, S. C.	23			0.20														0.14			
Chicago, Ill.	22-23			0.34														*			
Cincinnati, Ohio	3			0.32														0.09			
Cleveland, Ohio	11-12			0.85														0.20			
Columbia, Mo.	22			0.58														0.09			
Columbus, Ohio	3-4			0.29														0.10			
Denver, Colo.	11			T.																	
Des Moines, Iowa	2-3			0.40														0.19			
Detroit, Mich.	11			0.36														0.14			
Dodge, Kans.	1-2			0.04																	
Duluth, Minn.	2			0.94														*			
Eastport, Me.	12-13			0.84														0.10			
Elkins, W. Va.	23-24			0.95														0.15			
Erie, Pa.	11-12			0.98														*			
Escanaba, Mich.	11-12			0.81														0.49			
Evansville, Ind.	3			0.64														0.30			
Fort Worth, Tex.	2			0.76														0.64			
Fresno, Cal.	10			0.53														*			
Galveston, Tex.	22	1.00 p. m.	1.35 p. m.	0.84	1.10 p. m.	1.30 p. m.	0.03	0.15	0.42	0.60	0.78	0.81									
Grand Junction, Colo.	30			0.01																	
Harrisburg, Pa.	23-24			1.05														0.13			
Hatteras, N. C.	23			0.96														0.28			
Huron, S. Dak.	6			0.07														*			
Indianapolis, Ind.	3			0.24														0.10			
Jacksonville, Fla.	4			0.13														0.11			
Jupiter, Fla.	5	2.32 p. m.	3.13 p. m.	0.80	2.50 p. m.	3.10 p. m.	0.01	0.22	0.41	0.61	0.78										
Kalispell, Mont.	5			0.20														0.09			
Kansas City, Mo.	2-3			0.60														0.17			
Key West, Fla.	5			0.09						0.09											
Knoxville, Tenn.	23			0.57														0.15			
Lexington, Ky.	12			0.73														0.29			
Lincoln, Nebr.	2			0.36														0.14			
Little Rock, Ark.	2-3			1.43														0.64			
Los Angeles, Cal.	10			0.43														0.15			
Louisville, Ky.	3			0.51														0.14			
Macon, Ga.	18-19			0.38														0.10			
Memphis, Tenn.	3			0.47														0.19			
Meridian, Miss.	3			0.85														0.52			
Milwaukee, Wis.	3			0.25														0.09			
Montgomery, Ala.	18-19	4.15 p. m.	6.35 a. m.	1.55	9.53 p. m.	10.20 p. m.	0.49	0.14	0.21	0.30	0.45	0.50	0.54								
Nantucket, Mass.	24			0.32														0.08			
Nashville, Tenn.	3			0.39														0.11			
New Haven, Conn.	23-24			0.76														0.15			
New Orleans, La.	22	4.05 p. m.	7.30 p. m.	1.98	4.13 p. m.	5.20 p. m.	T.	0.16	0.37	0.71	0.87	0.97	1.07	1.20	1.30	1.36	1.40	1.63	1.79		
New York, N. Y.	23-24			0.97														0.14			
Norfolk, Va.	23-24			0.57														0.30			
Northfield, Vt.	12-13			0.37														*			
Oklahoma, Okla.	2			1.18														1.18*			
Omaha, Nebr.	2-3			0.28														0.23			
Parkersburg, W. Va.	23-24			0.81														0.15			
Philadelphia, Pa.	23-24			2.37														0.44			
Pittsburg, Pa.	23-24			0.97														0.18			
Pocatello, Idaho	10			0.27			....?											0.20			
Portland, Me.	1			0.17														0.12			
Portland, Oreg.	21-22			2.62														0.44			
Pueblo, Colo.	30			0.01																	
Raleigh, N. C.	23			0.41														0.16			
Richmond, Va.	23			1.25														0.34			
Rochester, N. Y.	11-12			0.55														0.24			
St. Louis, Mo.	22			0.57														0.11			
St. Paul, Minn.	2-3			1.47														0.56			
Salt Lake City, Utah.	10-11			0.49														0.12			
San Diego, Cal.	10			0.36														*			
Sandusky, Ohio	10-11			0.99														0.38			
San Francisco, Cal.	20-21			1.59														0.62			
Savannah, Ga.	19-20			0.62														0.18			
Seattle, Wash.	21-22			1.22														0.16			
Spokane, Wash.	22			1.04														*			
Springfield, Ill.	11			0.41														0.24			
Tampa, Fla.	11			0.18														0.16			
Toledo, Ohio	11			0.41														0.11			
Topeka, Kans.	2-3			0.55														0.13			
Valentine, Nebr.	4			0.03																	
Vicksburg, Miss.	3	10.12 a. m.	12.30 p. m.	0.90	10.38 a. m.	11.10 a. m.	T.	0.12	0.16	0.18	0.44	0.58	0.72	0.76							
Washington, D. C.	23-24			2.03														0.36			
Wilmington, N. C.	23			0.59														0.31			
Basseterre, St. Kitts.	1	12.15 a. m.	10.35 p. m.	6.70	6.15 a. m. 10.25 a. m. 12.30 p. m.	7.10 a. m. 11.15 a. m. 1.10 p. m.	0.29 1.68 3.41	0.07 0.14 0.25	0.18 0.38 0.48	0.20 0.44 0.59	0.49 0.46 0.66	0.62 0.50 0.79	0.86 0.67 1.02	0.94 0.77 1.27	0.97 0.88 1.39	0.97 1.16	1.09 1.44	1.20			
Do	2-3	10.48 a. m.	6.50 a. m.	5.36	2.25 p. m. 3.15 p. m.	3.15 p. m. 4.20 p. m.	0.54	0.11 0.83	0.18 1.14	0.21 1.18	0.30 1.24	0.40 1.37	0.53 1.43	0.61 1.49	0.63 1.53	0.65 1.68	0.71 1.83	2.15			
Bridgetown, Barbados	28-29			1.53														0.26			
Cienfuegos, Cuba	30			T.																	
Havana Cuba	29			0.46														0.22			
Kingston, Jamaica	19			0.37														0.28			
Port of Spain, Trin.	7	10.09 a. m. 12.59 p. m.	11.12 a. m. 4.05 p. m.	1.16 1.87	10.45 a. m. 1.05 p. m.	11.06 a. m. 1.30 p. m.	0.01 T.	0.28 0.15	0.47 0.35	0.77 0.77	1.12 1.13	1.15 1.41	.....	.....	.....	.....	.....	.....	.....		
Do	16	11.18 a. m.	1.23 p. m.	1.19	12.18 p. m.	12.48 p. m.	0.13	0.07	0.17	0.44	0.75	0.91	0.98	1.01	.....	.....	.....	.....	.....		
Puerto Principe, Cuba	1			0.13					0.13												

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration. From—	Total duration. To—	Total am't of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	Depths of precipitation (in inches) during periods of time as indicated. 5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Roseau, Dominica	3	6.13 p.m.	8.30 p.m.	0.92	6.20 p.m.	6.50 p.m.	0.01	0.06	0.21	0.41	0.54	0.63	0.69	0.73	0.75	.....	.....	.....	.....	.....	.....
San Juan, Porto Rico..	11-12	6.37 p.m.	5.45 a.m.	1.62	10.50 p.m.	11.20 p.m.	0.48	0.16	0.30	0.43	0.55	0.62	0.74	0.78	.....	.....	.....	.....	.....	.....	.....
Do.....	17	8.50 p.m.	10.40 p.m.	1.11	8.55 p.m.	9.35 p.m.	T.	0.08	0.18	0.26	0.38	0.49	0.64	0.74	0.79	.....	.....	.....	.....	.....	.....
Do.....	18	1.21 p.m.	4.15 p.m.	1.38	3.05 p.m.	3.35 p.m.	0.63	0.11	0.30	0.45	0.58	0.66	0.73	.....	.....	.....	.....	.....	.....	.....	.....
Santiago de Cuba	23-24	.....	.....	0.30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.18	.....	.....	.....
Santo Domingo, W. I..	15-16	.....	.....	1.48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.59	.....	.....	.....
Willemstad, Curaçao .	9	5.45 a.m.	10.55 a.m.	1.96	8.45 a.m.	9.50 a.m.	1.01	0.12	0.21	0.34	0.37	0.47	0.49	0.51	0.52	0.54	0.67	0.84	0.94	.....	.....

*Self-register not working.

TABLE VI.—*Data furnished by the Canadian Meteorological Service, November*, 1901.

Stations.	Pressure. Mean not reduced.	Pressure. Mean reduced.	Pressure. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Temperature. Mean maximum.	Temperature. Mean minimum.	Precipitation. Total.	Precipitation. Departure from normal.	Precipitation. Depth of snow.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*
St. Johns, N. F.....	29.60	29.75	—.21	39.1	+ 2.6	43.1	35.0	7.89	+2.35	1.1
Sydney, C. B. I.....	29.77	29.81	—.15	39.4	+ 2.3	44.7	34.0	3.68	—1.93	0.5
Halifax, N. S.....	29.72	29.83	—.17	40.1	+ 2.8	47.2	33.0	2.56	—2.66	T.
Grand Manan, N. B...	29.80	29.85	—.18	36.2	— 2.7	41.0	31.3	3.66	—0.57	2.6
Yarmouth, N. S.....	29.78	29.86	—.18	37.5	— 2.4	43.4	31.5	3.03	+0.09	7.6
Charlottet'n, P. E. I...	29.78	29.82	—.20	37.2	+ 1.7	42.6	31.9	2.16	—1.57	9.1
Chatham, N. B.....	29.84	29.86	—.13	33.4	+ 2.4	39.7	27.2	2.59	—0.83	15.1
Father Point, Que....	29.87	29.90	—.07	29.0	+ 0.1	35.5	22.6	1.42	—1.04	13.8
Quebec, Que.....	29.59	29.93	—.08	28.6	— 0.4	33.7	23.5	1.95	—2.07	18.2
Montreal, Que.....	29.75	29.97	—.05	29.4	— 2.4	34.3	24.4	4.07	+0.90	29.2
Bissett, Ont.....	29.42	30.06	+.06	25.1	— 4.0	32.7	17.5	2.68	+0.03	15.6
Ottawa, Ont.....	29.72	30.05	+.04	28.1	— 3.6	33.8	22.3	2.25	—0.34	18.5
Kingston, Ont	29.69	30.02	— 02	32.5	— 2.5	39.6	25.3	2.56	—1.06	7.4
Toronto, Ont	29.66	30.06	+.01	34.8	— 0.8	41.0	28.5	1.66	—1.29	3.2
White River, Ont.....	28.69	30.11	+.06	20.5	0.0	30.8	10.2	3.20	+1.31	34.4
Port Stanley, Ont ...	29.42	30.08	+.04	35.7	— 1.1	42.5	29.0	3.24	+0.09	10.4
Saugeen, Ont.....	29.33	30.07	+.05	34.7	— 0.3	41.0	28.5	1.48	—2.42	4.7

Stations.	Pressure. Mean not reduced.	Pressure. Mean reduced.	Pressure. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Temperature. Mean maximum.	Temperature. Mean minimum.	Precipitation. Total.	Precipitation. Departure from normal.	Precipitation. Depth of snow.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*
Parry Sound, Ont ...	29.32	30.04	+.02	29.7	— 2.4	37.3	22.2	3.86	—0.35	19.4
Port Arthur, Ont....	29.36	30.09	+.07	24.7	+ 0.7	33.1	16.3	0.71	—1.27	3.3
Winnipeg, Man.....	29.27	30.15	+.07	22.6	+ 4.6	32.7	12.5	0.06	—0.93	0.6
Minnedosa, Man.....	28.24	30.14	+.09	22.6	+ 5.3	33.4	11.9	0.53	—0.27	5.1
Qu'Appelle, Assin...	27.72	30.07	+.02	24.4	+ 5.6	35.3	13.5	0.17	—0.43	1.6
Medicine Hat; Assin.	27.66	30.02	—.03	32.9	+ 5.5	42.7	23.0	0.55	+0.22	3.0
Swift Current, Assin.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Calgary, Alberta	26.31	29.94	—.11	28.4	+ 2.6	40.0	16.7	0.40	+0.05	4.0
Banff, Alberta	25.27	30.03	.....	28.7	.....	35.9	21.5	1.30	—2.10	13.0
Edmonton, Alberta .	27.58	29.98	—.06	22.3	— 0.6	30.9	13.7	1.10	+0.88	11.0
Prince Albert, Sask..	28.41	30.04	+.01	16.3	+ 0.9	26.3	6.3	0.78	—0.04	7.8
Battleford, Sask.....	28.23	30.06	+.02	20.8	+ 4.5	30.2	11.3	0.23	—0.37	2.3
Kamloops, B. C	28.67	29.97	—.06	41.2	+ 7.8	47.3	35.1	1.23	+0.13	T.
Victoria, B. C	29.86	29.96	—.06	48.5	+ 5.3	51.9	45.1	6.44	+4.11	
Barkerville, N. W. T.	25.48	29.86	—.14	31.2	+ 7.6	36.5	26.0	3.90	+0.30	20.0
Hamilton, Bermuda.	29.76	29.92	—.10	65.8	— 2.9	70.2	61.4	7.82	+3.62	

TABLE VII.—*Heights of rivers referred to zeros of gages, November, 1901.*

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Mississippi River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
St. Paul, Minn	1,954	14	2.8	3	1.3	25,29	2.1	1.5
Reeds Landing, Minn	1,884	12	1.9	7	0.8	29,30	1.4	1.1
La Crosse, Wis	1,819	12	3.0	5-7,10-16	2.0	30	2.7	1.0
Prairie du Chien, Wis	1,759	18	3.0	12	1.7	30	2.5	1.3
Dubuque, Iowa	1,699	15	3.3	13	2.5	30	3.0	0.8
Leclaire, Iowa	1,609	10	1.7	1,14,15	1.2	29,30	1.5	0.5
Davenport, Iowa	1,593	15	2.9	15	2.4	28-30	2.7	0.5
Muscatine, Iowa	1,562	16	3.3	16-18,26	2.9	7,30	3.1	0.4
Galland, Iowa	1,472	8	1.4	3	1.0	29,30	1.2	0.4
Keokuk, Iowa	1,463	15	1.6	1	1.0	9,30	1.3	0.6
Hannibal, Mo	1,402	13	2.5	1	1.9	8-13	2.1	0.6
Grafton, Ill	1,306	23	3.9	1,2	3.3	11	3.5	0.6
St. Louis, Mo	1,264	30	4.1	1	2.9	30	3.4	1.2
Chester, Ill	1,189	36	2.9	1	1.9	29,30	2.3	1.0
New Madrid, Mo	1,003	34	4.7	1	3.3	28-30	3.7	1.4
Memphis, Tenn	843	33	1.2	1	-0.2	29,30	0.3	1.4
Helena, Ark	767	42	3.8	1	1.5	29,30	2.3	2.3
Arkansas City, Ark	635	42	3.4	1	1.0	29,30	1.8	2.4
Greenville, Miss	595	42	3.0	1	0.9	30	1.7	2.1
Vicksburg, Miss	474	45	0.8	1	-2.2	27-30	-1.2	3.0
New Orleans, La	108	16	4.0	2,3	2.8	22,23,28	3.3	1.2
Missouri River.								
Bismarck, N. Dak	1,309	14	1.5	30	-0.5	10	0.6	2.0
Pierre, S. Dak	1,114	14	2.6	6	1.2	21-24	1.8	1.4
Sioux City, Iowa	784	19	5.9	3	4.7	28-30	5.3	1.2
Omaha, Nebr	669	18	5.9	1	4.5	28-30	5.3	1.4
St. Joseph, Mo	481	10	2.6	4	0.6	28-30	1.5	2.0
Kansas City, Mo	388	21	7.8	5,6	6.3	29,30	7.0	1.5
Boonville, Mo	199	30	6.4	18	5.3	30	5.9	1.1
Hermann, Mo	103	24	4.2	10	3.2	29,30	3.7	1.0
Illinois River.								
Peoria, Ill	135	14	6.5	25-30	6.2	1	6.4	0.3
Youghiogheny River.								
Confluence, Pa	59	10	2.0	26	0.0	2-12	0.5	2.0
West Newton, Pa	15	23	2.5	25	0.0	1-12	0.4	2.5
Allegheny River.								
Warren, Pa	177	14	5.9	25	0.0	7-11	2.0	5.9
Oil City, Pa	123	13	8.1	26	0.3	11,12	2.6	7.8
Parker, Pa	73	20	8.5	26	-0.2	10,11	2.6	8.7
Monongahela River.								
Weston, W. Va	161	18	2.4	25,26	-0.5	1-11	0.0	2.9
Fairmont, W. Va	119	25	3.9	26	0.0	1-12	0.9	3.9
Greensboro, Pa	81	18	9.0	26	6.0	1-14	6 5	3.0
Lock No. 4, Pa	40	28	10.5	26	4.5	3,4	5.6	6.0
Conemaugh River.								
Johnstown, Pa	64	7	2.4	25	0.4	6-12	0.8	2.0
Red Bank Creek.								
Brookville, Pa	35	8	2.6	24	-0.2	1-23	0.2	2.8
Beaver River.								
Ellwood Junction, Pa	10	14	4.3	28,29	1.8	7,9-14	2.3	2.5
Great Kanawha River.								
Charleston, W. Va	58	30	7.0	9,16,25-28	5.0	20,21	6.7	2.0
Little Kanawha River.								
Glenville, W. Va	103	20	3.5	25	-2.5	1-4	-0.9	6.0
New River.								
Hinton, W. Va	95	14	2.5	25	1.7	{16,17,19-23,30}	1.8	0.8
Cheat River.								
Rowlesburg, W. Va	36	14	2.4	26,27	-1.4	10-12	0.3	3.8
Ohio River.								
Pittsburg, Pa	966	22	11.0	26	4.9	17	6.2	6.1
Davis Island Dam, Pa	960	25	11.5	26	1.8	6-8	4.4	9.7
Wheeling, W. Va	875	36	14.6	27	1.5	8-12	4.7	13.1
Parkersburg, W. Va	785	36	14.0	28	1.9	9-12	4.7	12.1
Point Pleasant, W. Va	703	39	12.8	29	1.9	5-17	3.8	10.9
Huntington, W. Va	660	50	15.5	29,30	3.8	16	6.1	11.7
Catlettsburg, Ky	651	50	15.2	30	1.9	10,11	4.4	13.3
Portsmouth, Ohio	612	50	15.3	30	3.1	11,12,15-18	5.1	12.2
Cincinnati, Ohio	499	50	11.4	30	4.2	{11-13,15,18-20}	5.6	7.2
Madison, Ind	413	46	7.5	30	3.8	20,21	4.8	3.7
Louisville, Ky	367	28	4.4	25	2.8	15-32	3.2	1.6
Evansville, Ind	184	35	4.3	29	1.7	19-25	2.2	2.6
Paducah, Ky	47	40	2.3	1	1.5	18-21,26-28	1.8	0.8
Cairo, Ill	1,073	45	4.4	1	2.9	21,22,27-29	3.3	1.5
Muskingum River.								
Zanesville, Ohio	70	30	6.4	17	5.9	2,3	6.2	0.5
Scioto River.								
Columbus, Ohio	110	17	1.9	1-30	1.9	1-30	1.9	0.0
Miami River.								
Dayton, Ohio	77	18	0.5	4,5	0.1	24	0.3	0.4
Wabash River.								
Mount Carmel, Ill	50	15	0.7	1-3,23-30	0.5	8-16	0.6	0.2
Licking River.								
Falmouth, Ky	30	25	1.0	26,29,30	0.2	1-11	0.5	0.8
Kentucky River.								
Frankfort, Ky	65	31	6.3	26-29	4.9	1,2	5.8	1.4
Clinch River.								
Speers Ferry, Va	156	20	-0.1	5	-0.7	22	-0.4	0.6
Clinton, Tenn	52	25	2.7	1,13-16	2.5	4-12,18-30	2.5	0.2
Tennessee River.								
Knoxville, Tenn	635	29	1.4	26	0.8	21,22	1.0	0.6
Kingston, Tenn	556	25	1.7	25-27	1.4	8-11,22,23	1.5	0.3
Chattanooga, Tenn	452	33	2.6	1,2,27	2.1	22	2.4	0.5
Bridgeport, Ala	402	24	1.2	27	0.8	23	1.0	0.4
Florence, Ala	255	16	1.1	1,2	0.9	22-25	1.0	0.2
Riverton, Ala	225	25	0.4	1,4	-0.1	24,28	0.2	0.5
Johnsonville, Tenn	95	24	2.0	1,2	1.6	28-30	1.8	0.4

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Cumberland River.	*Miles.*	*Feet*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Burnside, Ky	516	50	2.0	28	0.4	12	0.8	1.6
Carthage, Tenn	305	40	1.5	30	0.9	8	1.2	0.6
Nashville, Tenn	189	40	2.1	30	1.6	1-5,13,14	1.7	0.5
Clarksville, Tenn	126	42	2.5	21-23,29,30	2.1	12,13	2.3	0.4
Arkansas River.								
Wichita, Kans	832	10	1.7	4	1.2	30	1.4	0.5
Webbers Falls, Ind. T	465	23	1.8	9	1.5	1-7,12-30	1.5	0.3
Fort Smith, Ark	403	22	1.5	15	0.3	1,2	1.0	1.2
Dardanelle, Ark	256	21	0.7	18	0.2	9	0.4	0.5
Little Rock, Ark	176	23	1.8	2,3,20,21	1.4	8-11	1.6	0.4
White River.								
Newport, Ark	150	26	0.1	22-30	-0.2	1-9	-0.1	0.3
Yazoo River.								
Yazoo City, Miss	80	25	0.6	29	-1.8	16-18	-1.1	2.4
Red River.								
Arthur City, Tex	638	27	3.8	30	2.9	18,19	3.2	0.9
Fulton, Ark	515	28	3.8	8,9	2.6	1-3	3.2	1.2
Shreveport, La	327	29	-0.5	12,13	-1.0	6-9,19-21	-0.8	0.5
Alexandria, La	118	33	-2.5	1,30	-3.4	23,24	-2.9	0.9
Ouachita River.								
Camden, Ark	304	39	5.7	27	3.1	1-5	4.2	2.6
Monroe, La	122	40	2.8	30	0.4	1-11	1.0	2.4
Atchafalaya River.								
Melville, La	100	31	4.6	1-4	2.8	22	3.5	1.8
Susquehanna River.								
Wilkesbarre, Pa	183	14	5.0	26	-1.1	3-11	0.3	6.1
Harrisburg, Pa	69	17	5.4	27	1.0	12	1.9	4.4
W. Br. of Susquehanna.								
Williamsport, Pa	39	20	6.7	26	0.4	11	1.7	6.3
Juniata River.								
Huntingdon, Pa	90	24	3.0	1-30	3.0	1-30	3.0	0.0
Potomac River.								
Cumberland, Md.*	290	8	3.6	25	1.1	23	2.1	2.5
Harpers Ferry, W. Va	172	16	6.5	25	-1.2	23	-0.1	7.7
James River.								
Lynchburg, Va	260	18	1.1	25	0.1	22,23	0.3	1.0
Richmond, Va	111	12	0.6	14,15	-0.4	1	0.4	1.0
Roanoke River.								
Weldon, N. C	129	30	10.3	26	8.7	19-23	8.9	1.6
Cape Fear River.								
Fayetteville, N. C	112	38	6.1	26	3.5	{11-13,18-20-23}	3.9	2.6
Edisto River.								
Edisto, S. C	75	6	2.7	1,2	2.0	20,21,30	2.3	0.7
Pedee River.								
Cheraw, S. C	149	27	4.9	26	2.6	19,20,22,23	2.9	2.3
Black River.								
Kingstree, S. C	52	12	2.4	29,30	0.7	4,5	1.6	1.7
Lynch Creek.								
Effingham, S. C	35	12	4.7	29,30	3.3	1,2	3.9	1.4
Santee River.								
St. Stephens, S. C	97	12	5.5	29	4.0	22,23	4.6	1.5
Congaree River.								
Columbia, S. C	37	15	1.5	26	0.8	17	1.1	0.7
Wateree River.								
Camden, S. C	45	24	5.3	26	3.8	3	4.4	1.5
Waccamaw River.								
Conway, S. C	40	7	3.2	1	1.0	25	2.1	2.2
Savannah River.								
Calhoun Falls, S. C	347	15	2.4	1,21,22	1.9	13-17	2.1	0.5
Augusta, Ga	268	32	9.0	24	8.2	3,10,30	8.4	0.8
Broad River.								
Carlton, Ga	30	11	2.7	21	2.5	{1-4,6-12 15-18 27-30}	2.5	0.2
Flint River.								
Albany, Ga	80	20	4.5	7	0.7	22	2.9	3.8
Chattahoochee River.								
Westpoint, Ga	239	20	3.5	22	2.4	18	2.7	1.1
Ocmulgee River.								
Macon, Ga	125	18	2.5	22	1.7	1-4	2.0	0.8
Oconee River.								
Dublin, Ga	79	30	1.7	23	0.8	1-5,15	1.1	0.9
Coosa River.								
Rome, Ga	271	30	1.6	21	1.0	11-20	1.2	0.6
Gadsden, Ala	144	18	1.0	1	0.1	29,30	0.6	0.9
Alabama River.								
Montgomery, Ala	265	35	2.0	23-26	1.2	11,12	1.6	0.8
Selma, Ala	212	35	2.0	27-29	1.3	16-18	1.6	0.7
Tombigbee River.								
Columbus, Miss	303	33	-1.8	27,28	-3.0	1-3,7	-2.6	1.2
Demopolis, Ala	155	35	1.1	27	-1.6	2-6	-0.7	3.7
Black Warrior River.								
Tuscaloosa, Ala	129	43	2.0	23-25,28	0.7	3	1.3	1.3
Brazos River.								
Kopperl, Tex	369	21	1.4	13	-1.0	1-12	-0.5	2.4
Waco, Tex	301	22	1.8	4,5	0.8	1-3	1.0	1.0
Booth, Tex	76	39	0.1	6-8	-0.1	14-17,28-30	0.0	0.2
Red River of the North.								
Moorhead, Minn	418	26	8.0	15,16	6.8	6	7.6	1.2
Columbia River.								
Umatilla, Oreg	270	25	-1.2	1	-3.4	30	-2.4	2.2
The Dalles, Oreg	166	40	3.7	28	1.8	2	2.6	1.9
Willamette River.								
Albany, Oreg	119	20	9.4	24	1.0	14	2.7	8.4
Portland, Oreg	12	15	8.1	24	0.8	4	3.4	7.3
Sacramento River.								
Red Bluff, Cal	265	23	12.3	29	-0.1	3-7	2.0	12.4
Sacramento, Cal	64	29	14.6	30	8.1	8,9	9.4	6.5

* 15 days only.

XXIX—118.

• Baskerville

Chart I. Tracks of Centers of High Areas. November, 1901.

Chart I. Tracks of Centers of High Areas. November, 1901.

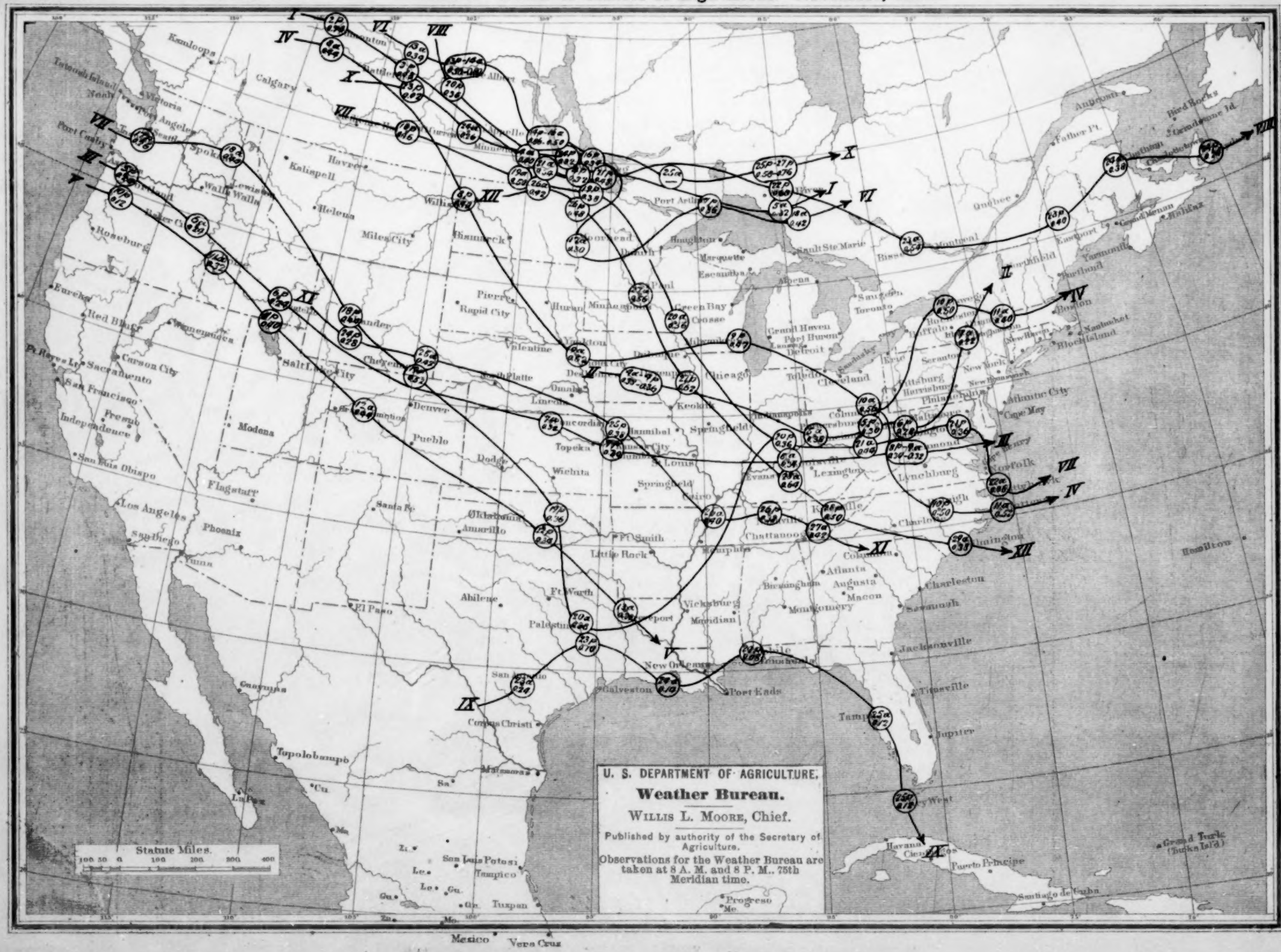

Chart II. Tracks of Centers of Low Areas. November, 1901.

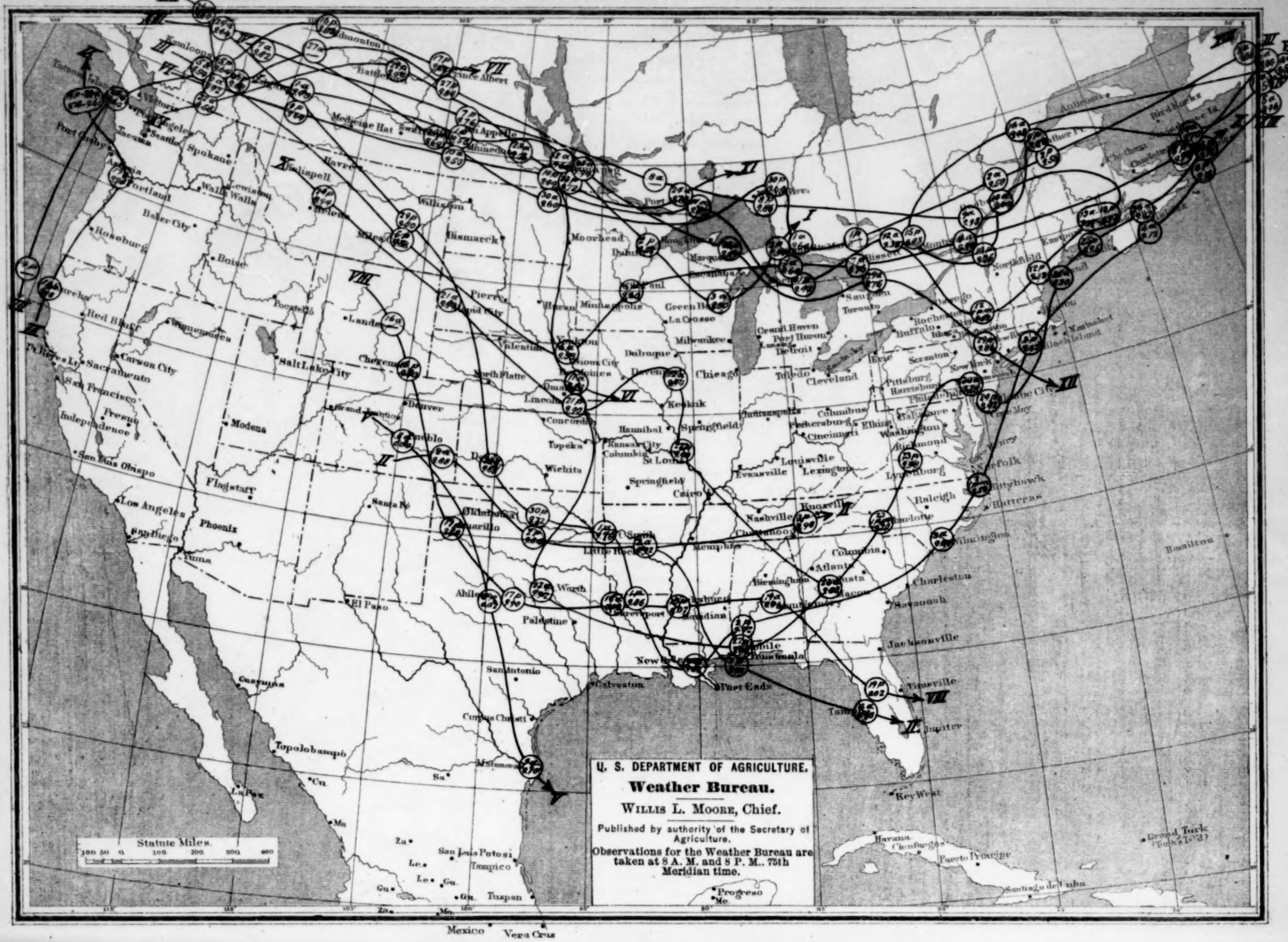

Chart III. Total Precipitation. November, 1901.

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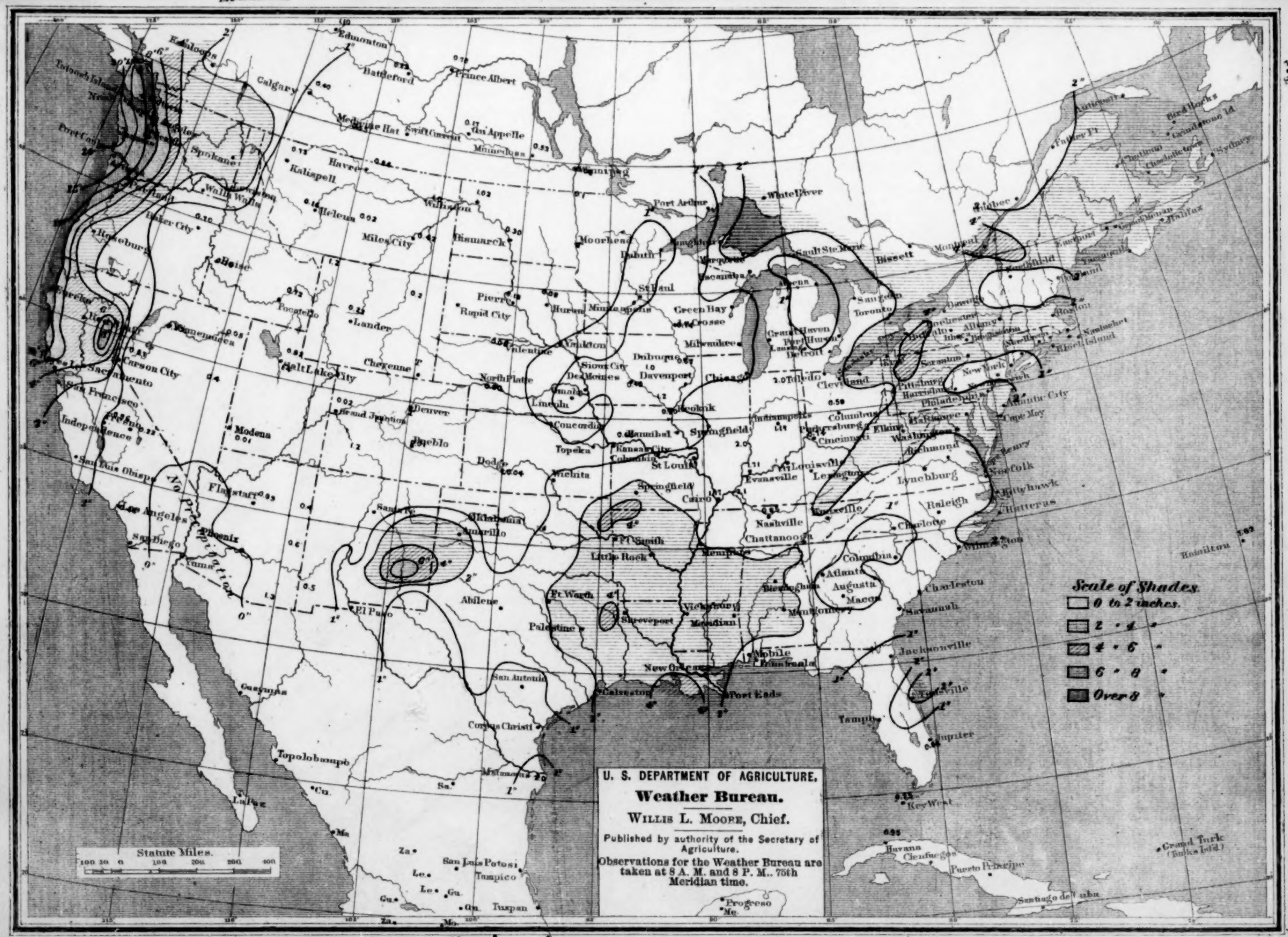
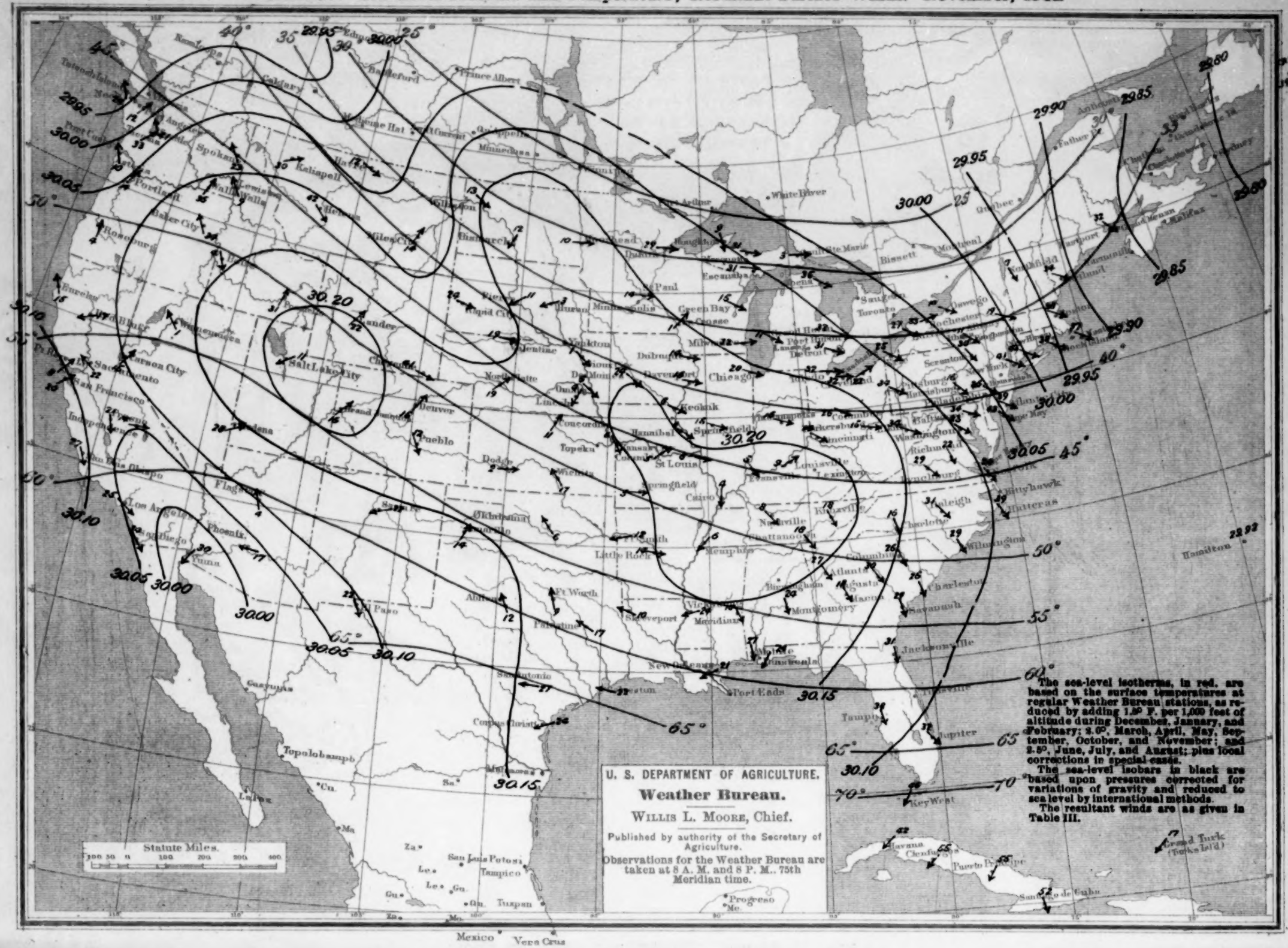


Chart IV. Sea-Level Pressure and Temperature; Resultant Surface Winds. November, 1901.


Statute Miles.
300 50 0 100 200 300 400
U. S. DEPARTMENT OF AGRICULTURE.
Weather Bureau.
WILLIS L. MOORE, Chief.
Published by authority of the Secretary of Agriculture.
Observations for the Weather Bureau are taken at 8 A. M. and 8 P. M., 75th Meridian time.
The sea-level isotherms, in red, are based on the surface temperatures at regular Weather Bureau stations, as reduced by adding 1.5° F. per 1,000 feet of altitude during December, January, and February; 2.0°, March, April, May, September, October, and November; and 2.5°, June, July, and August; plus local corrections in special cases.
The sea-level isobars in black are based upon pressures corrected for variations of gravity and reduced to sea level by international methods.
The resultant winds are as given in Table III.

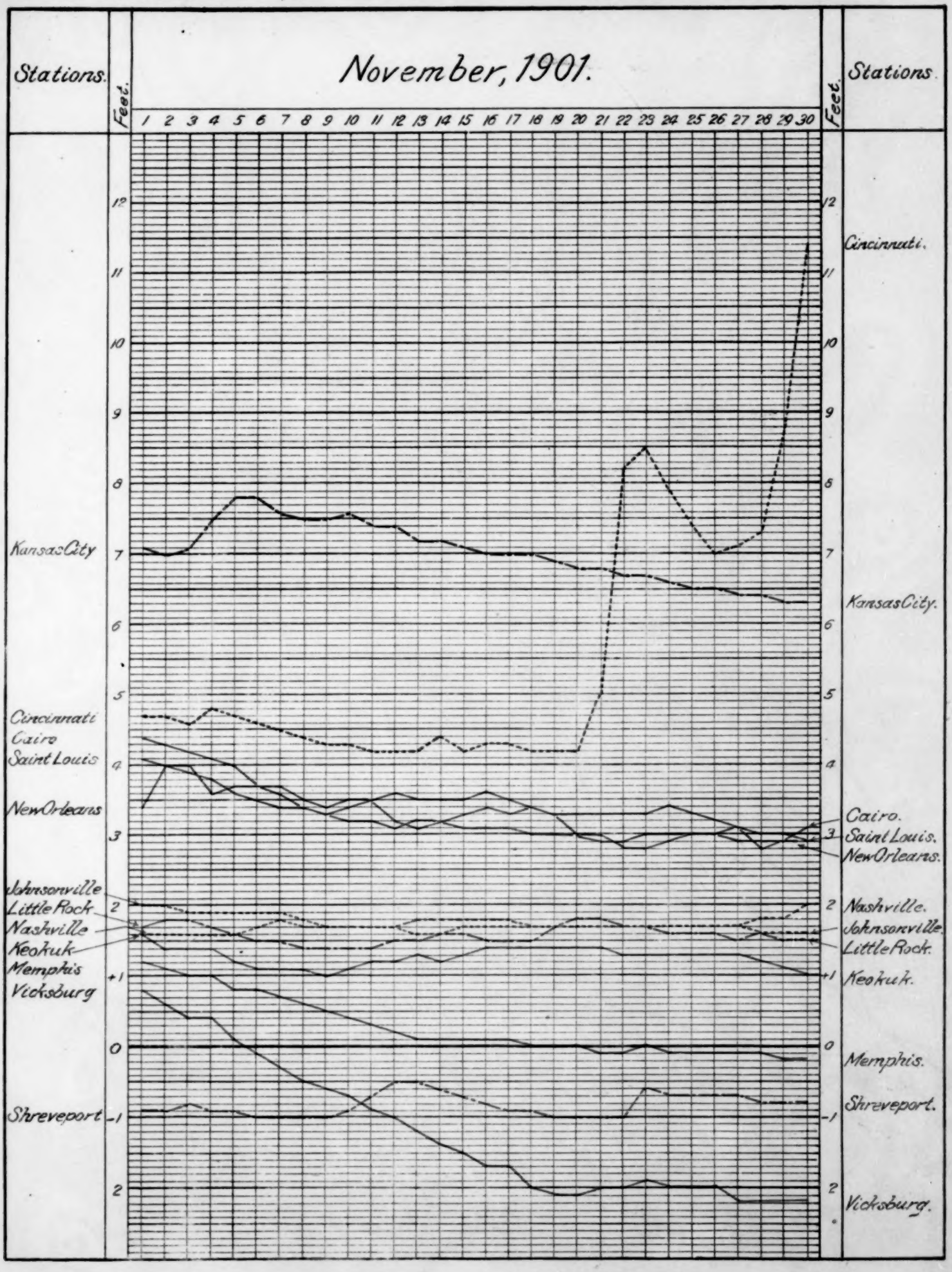

Stations.
Feet.
November, 1901.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
12
11
10
9
8
7
6
5
4
3
2
+1
0
-1
2
Kansas City
Cincinnati
Cairo
Saint Louis
New Orleans
Johnsonville
Little Rock
Nashville
Keokuk
Memphis
Vicksburg
Shreveport
Feet.
Stations.
Cincinnati.
Kansas City.
Cairo.
Saint Louis.
New Orleans.
Nashville.
Johnsonville.
Little Rock.
Keokuk.
Memphis.
Shreveport.
Vicksburg.

Chart VI. Surface Temperatures; Maximum, Minimum, and Mean. November, 1901.

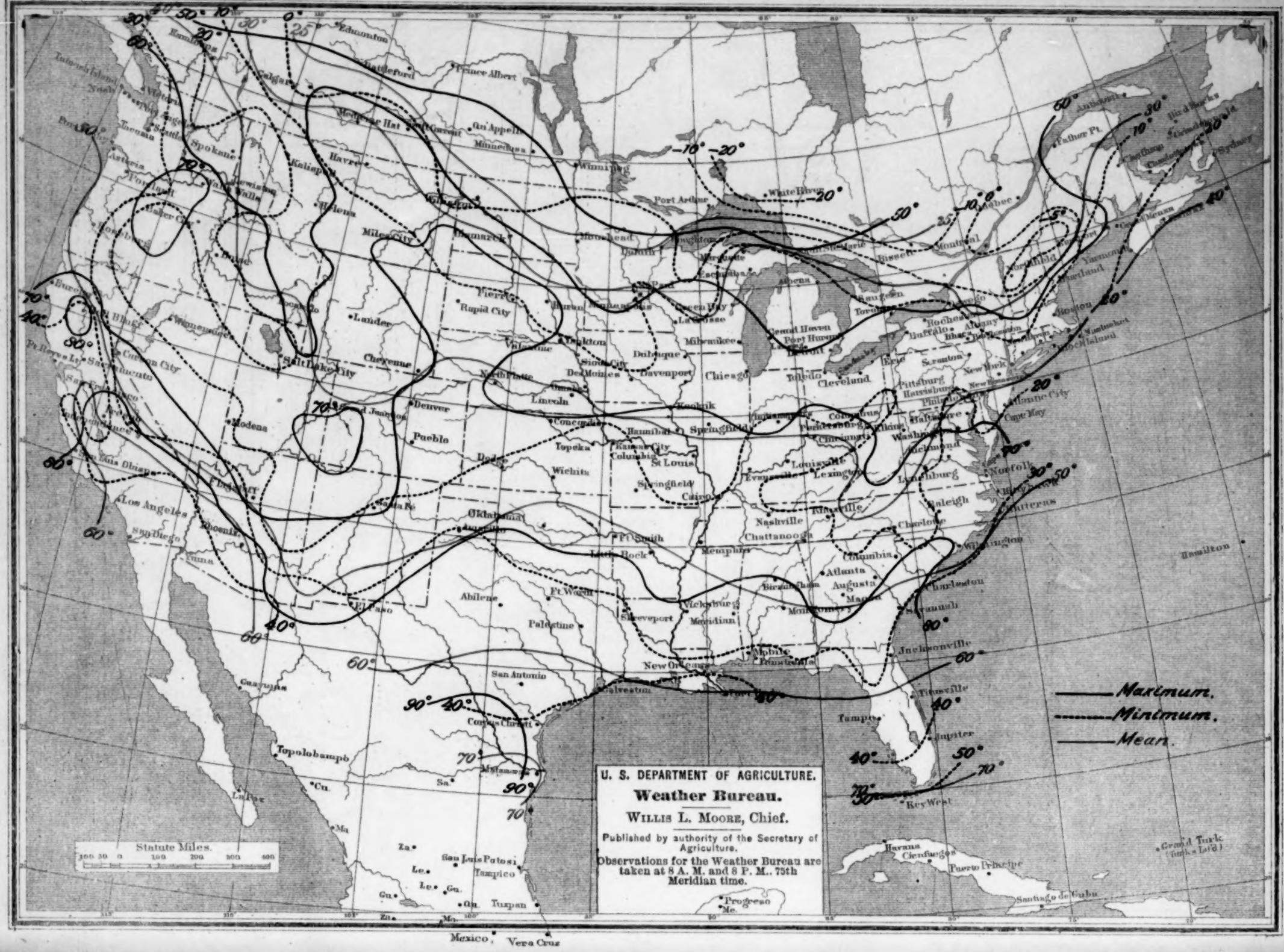
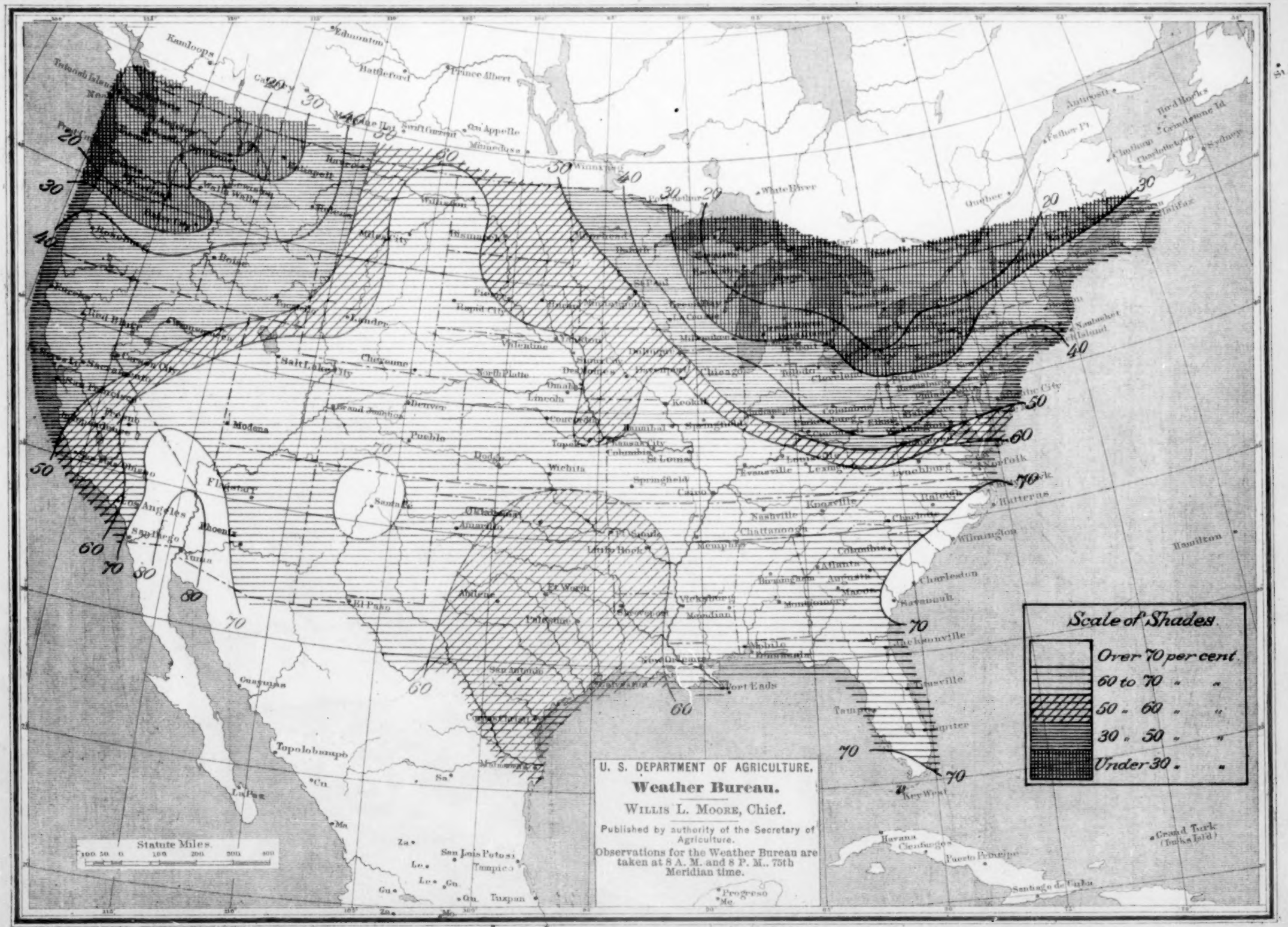
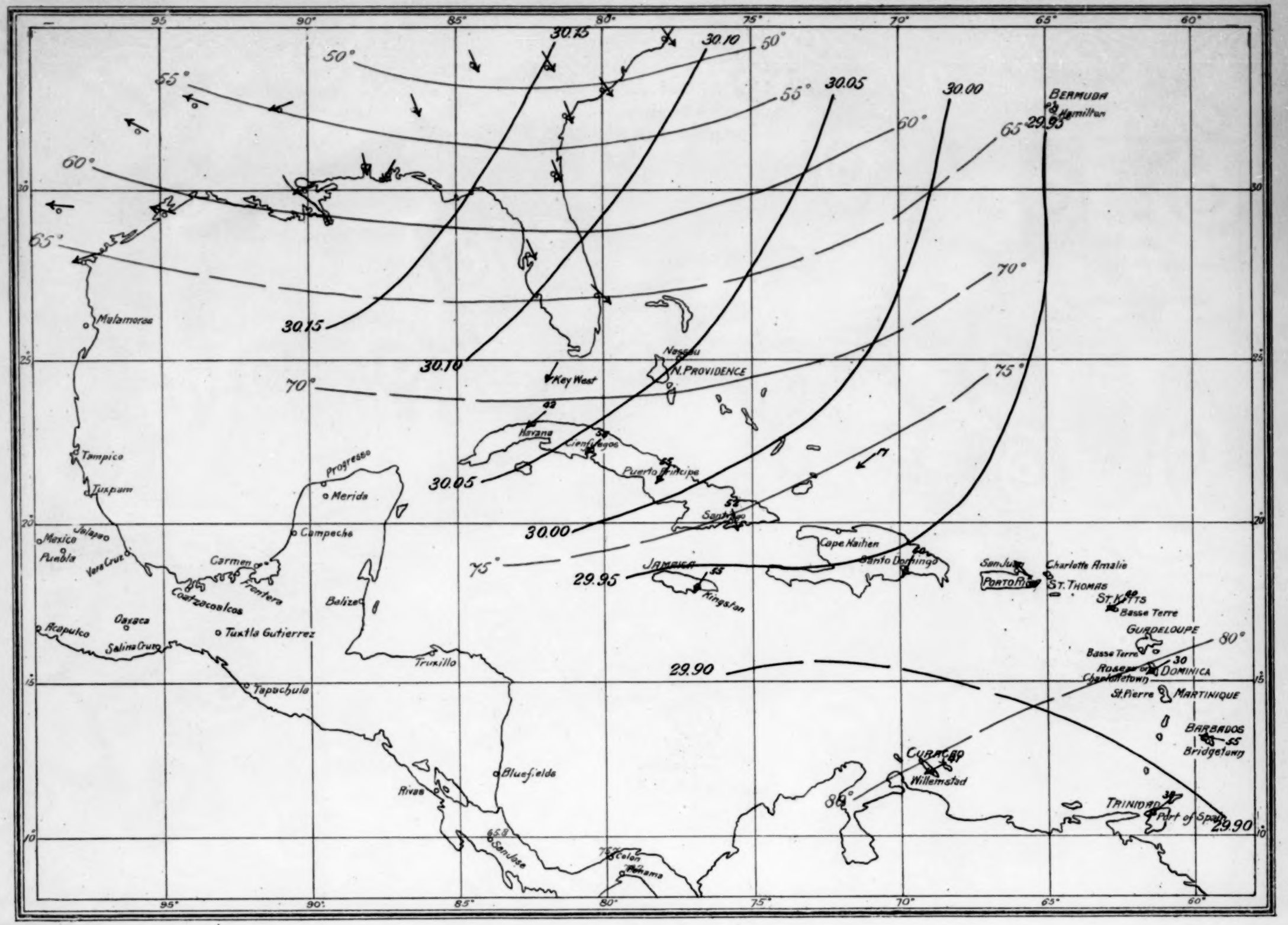


Chart VII. Percentage of Sunshine. November, 1901.

Chart VII. Percentage of Sunshine. November, 1901.



XXIX—125. **Chart VIII. West Indian Monthly Isobars, Isotherms, and Resultant Winds. November, 1901.**



XXIX—126. Barkerville **Chart IX. Total Snowfall for November, 1901.**

Chart IX. Total Snowfall for November, 1901.

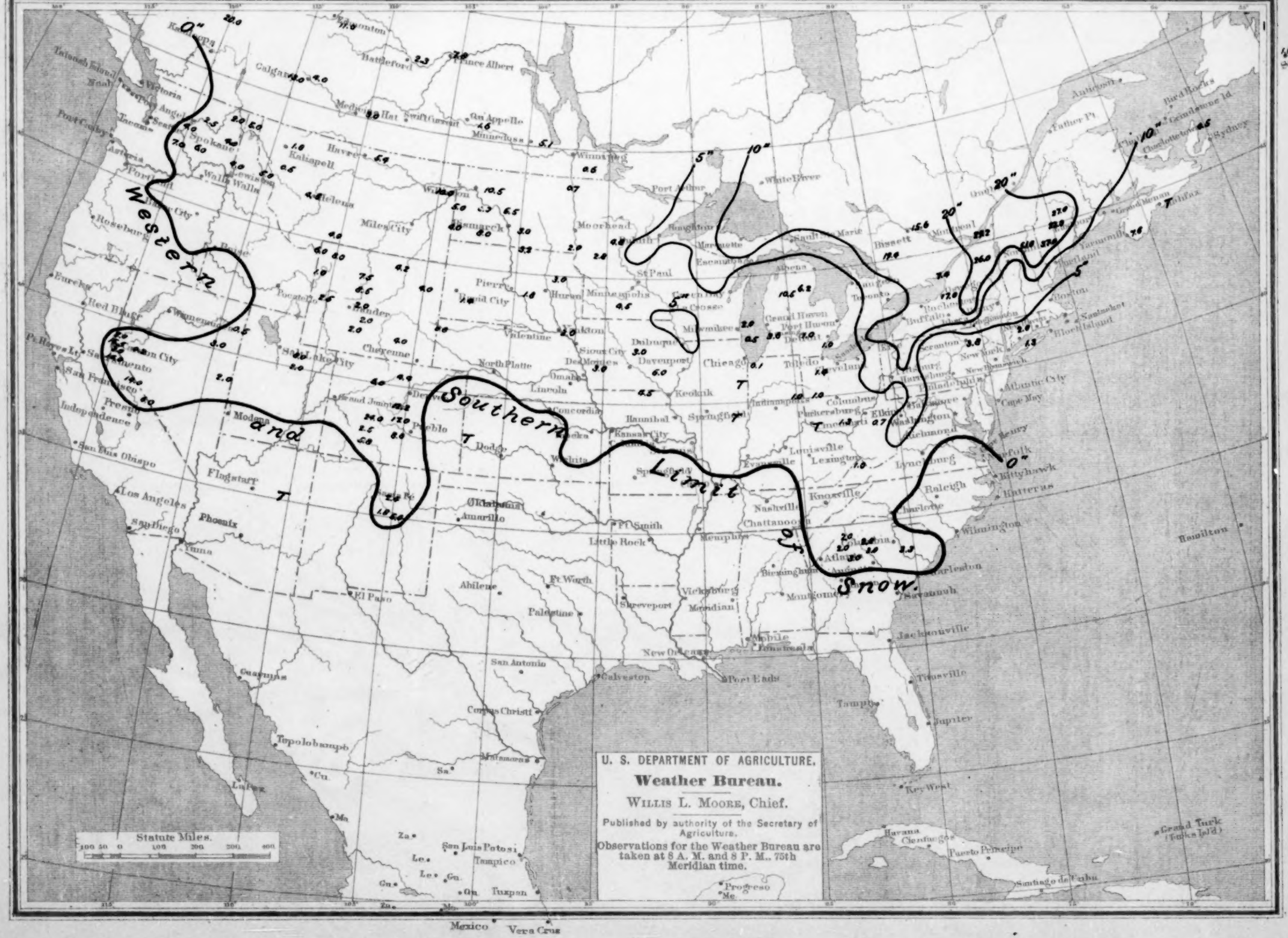


Chart X. Departures from the Daily Normal Barometric Pressure for each hour of 75th meridian time.

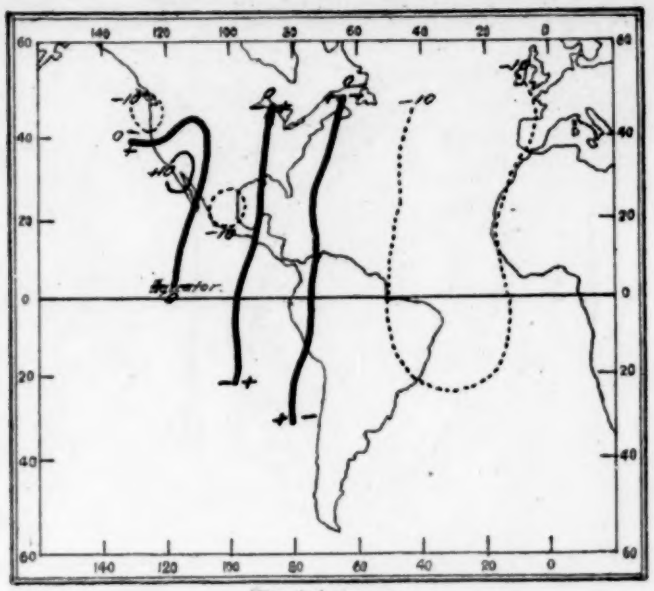


Fig. 1—1 a. m.

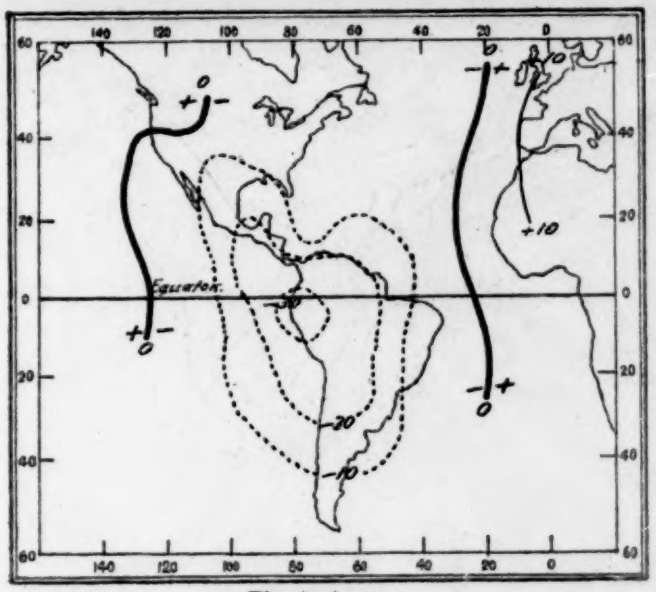


Fig. 4—4 a. m.

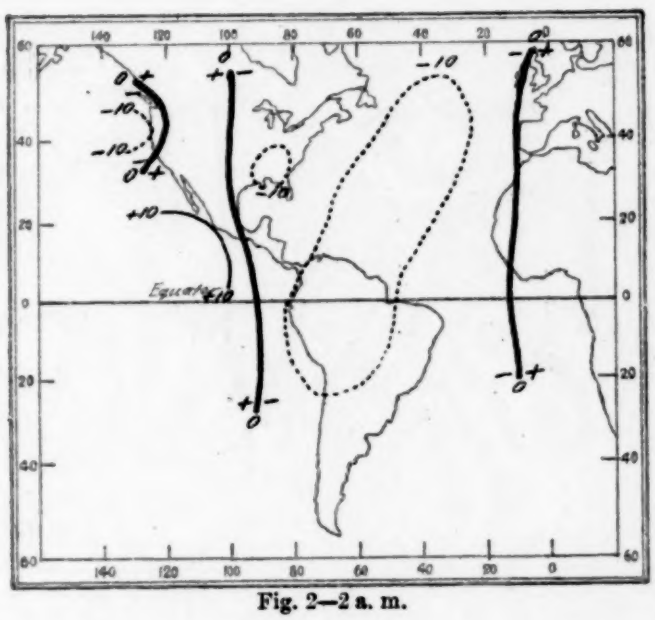


Fig. 2—2 a. m.

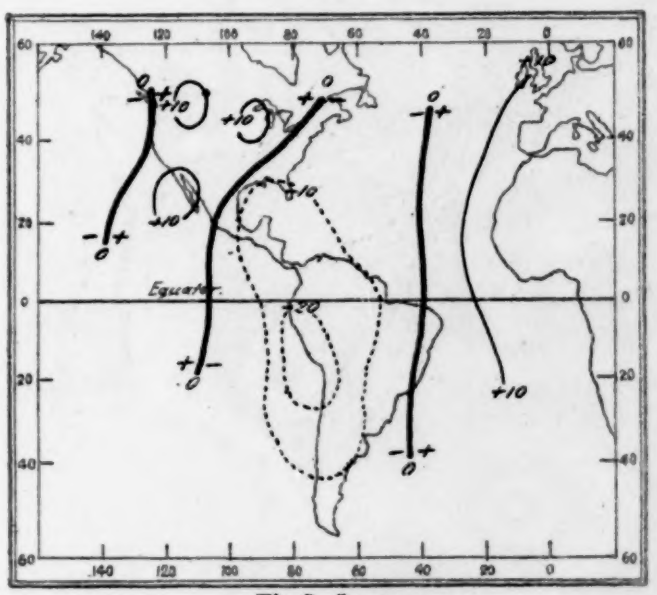


Fig. 5—5 a. m.

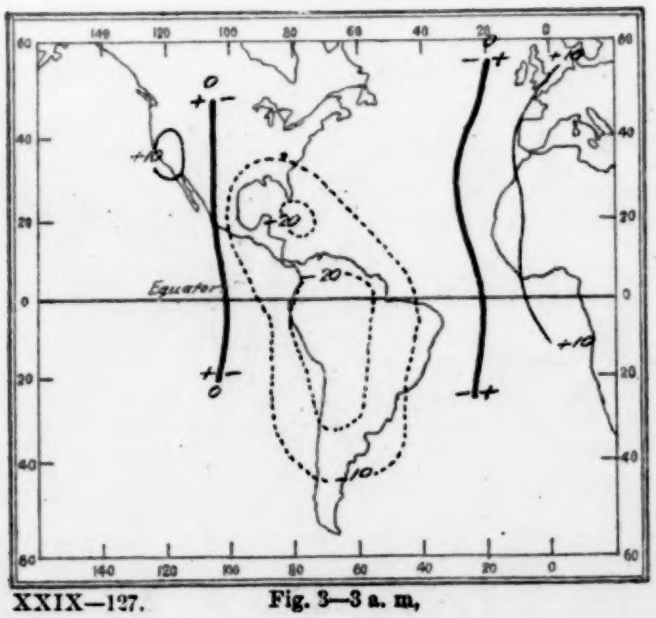


Fig. 3—3 a. m.

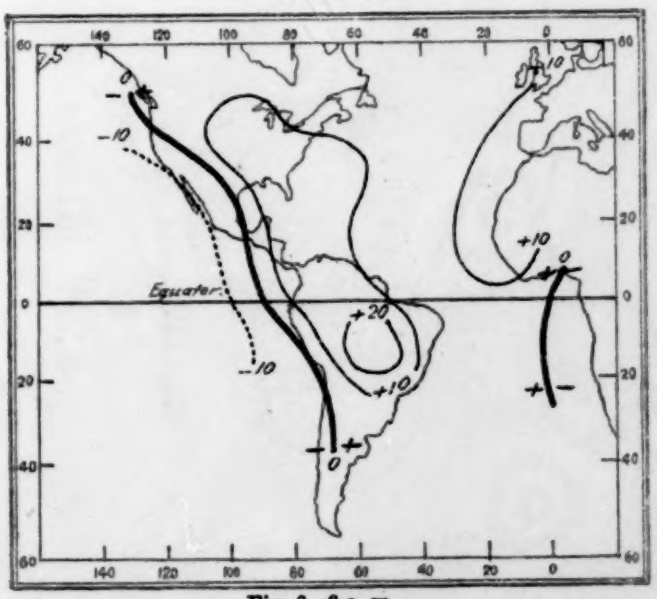


Fig. 6—6 a. m.

Chart XI. Departures from the Daily Normal Barometric Pressure for each hour of 75th meridian time.

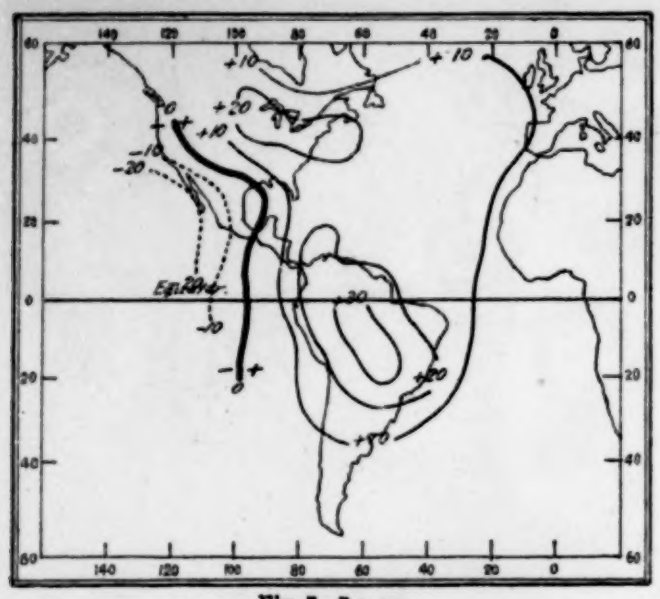


Fig. 7—7 a. m.

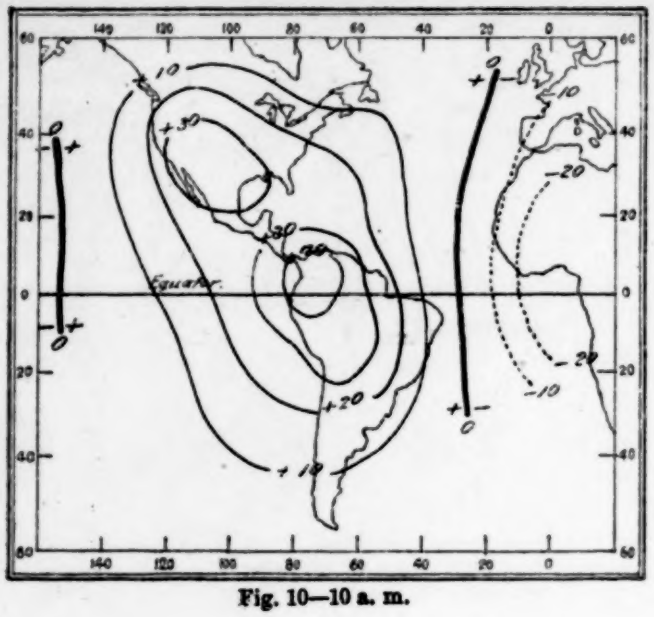


Fig. 10—10 a. m.

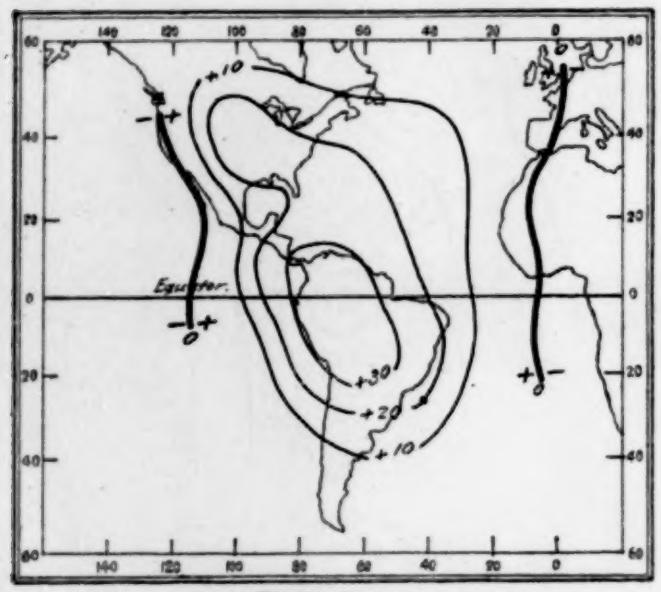


Fig. 8—8 a. m.

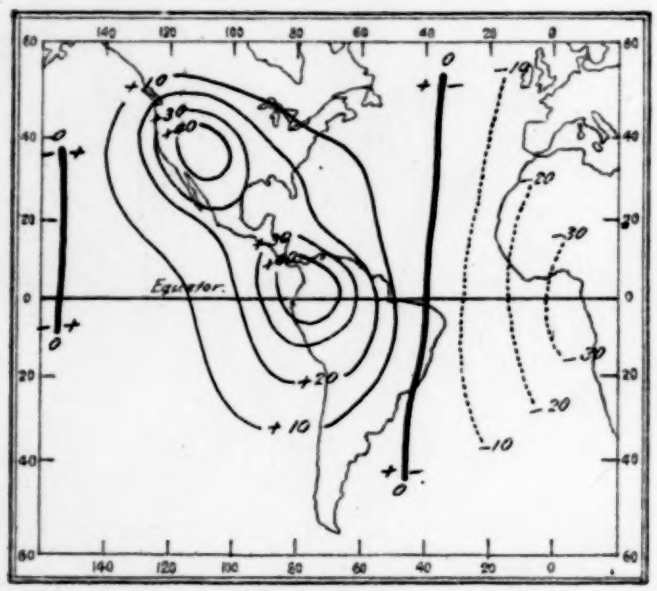


Fig. 11—11 a. m.

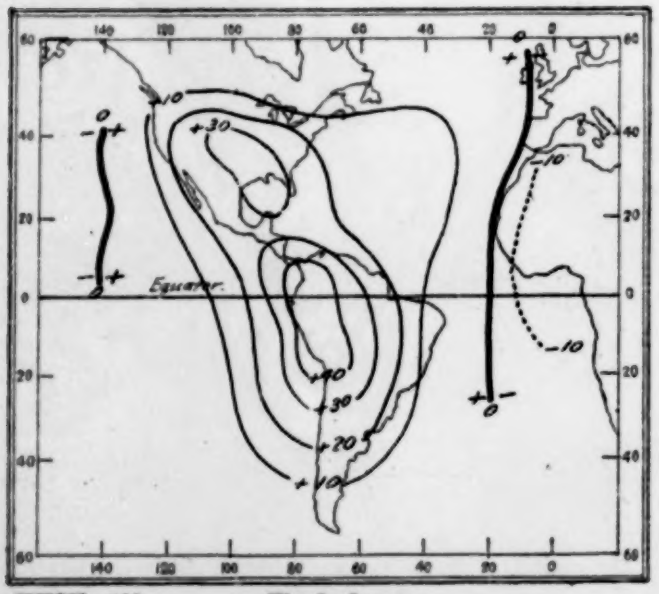


Fig. 9—9 a. m.

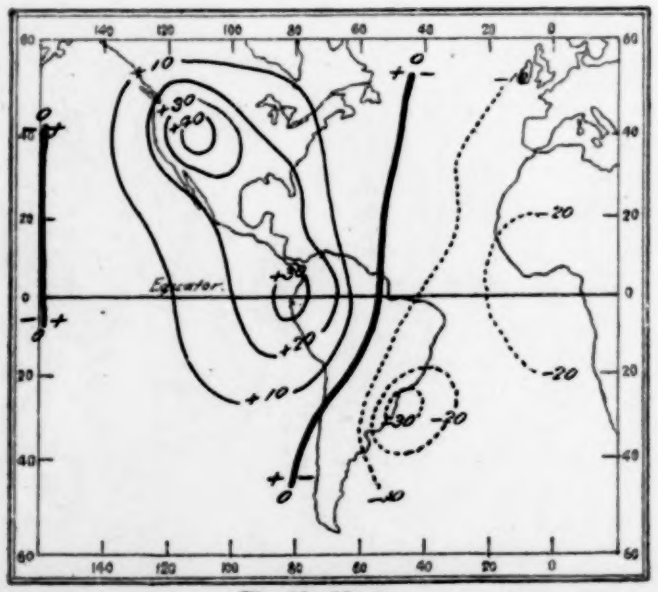


Fig. 12—12 noon.

Chart XII. Departures from the Daily Normal Barometric Pressure for each hour of 75th meridian time.

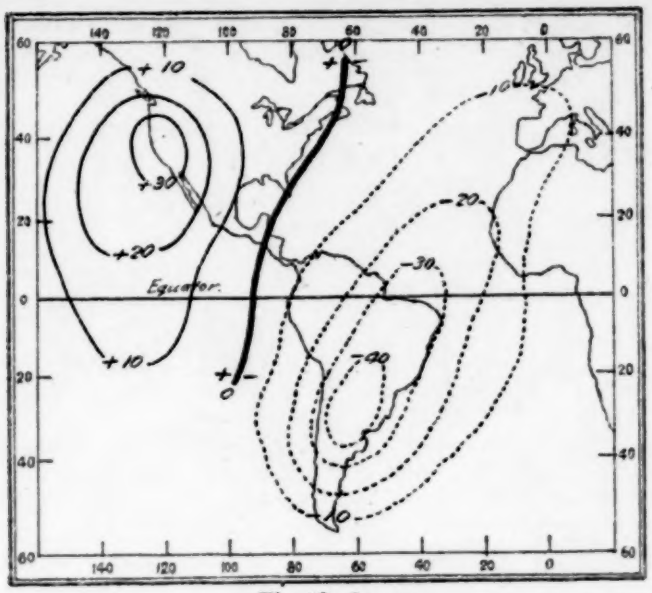


Fig. 13—1 p. m.

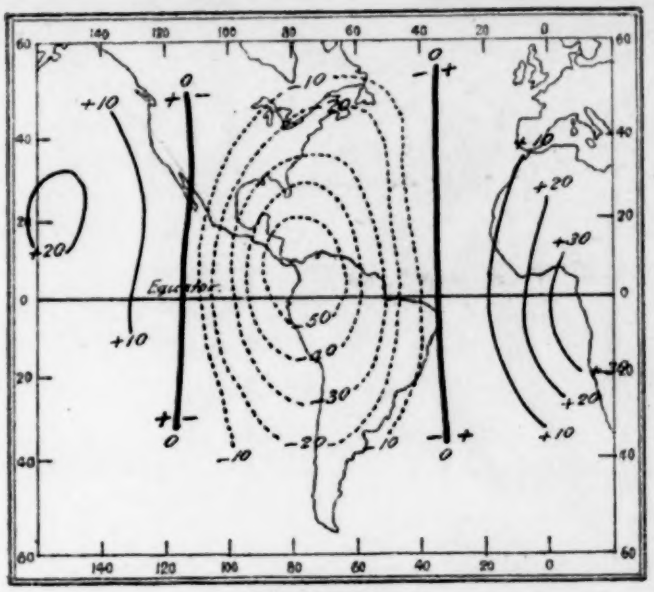


Fig. 16—4 p. m.

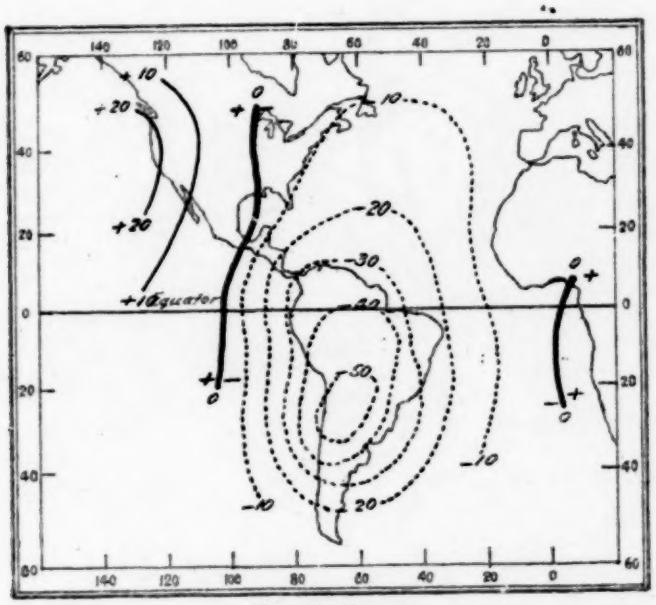


Fig. 14—2 p. m.

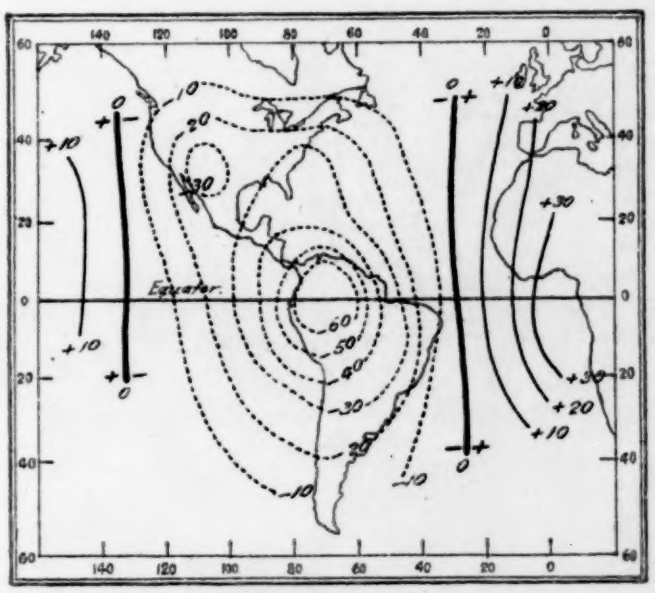


Fig. 17—5 p. m.

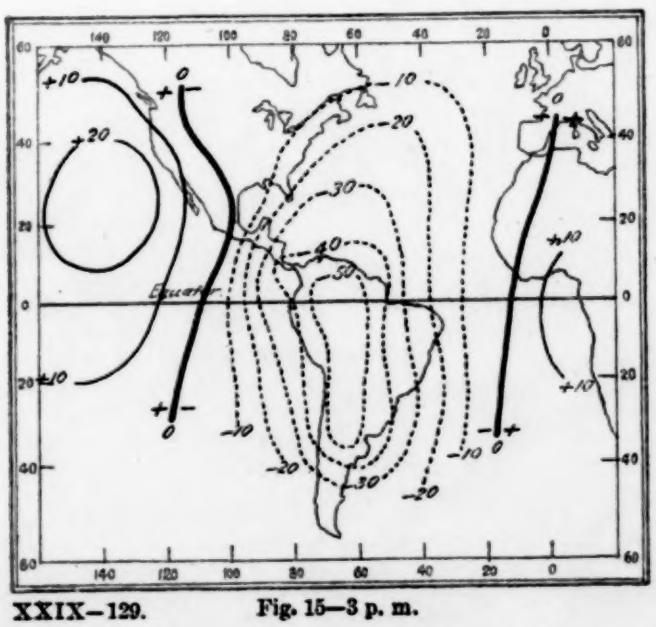


Fig. 15—3 p. m.

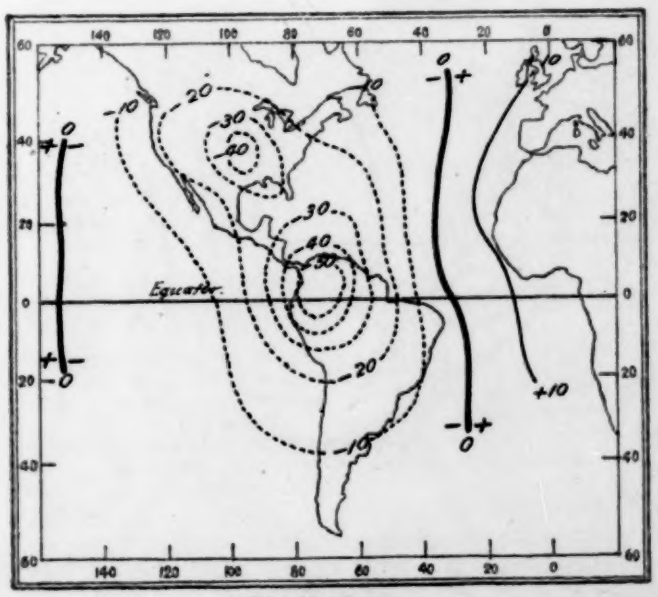


Fig. 18—6 p. m.

Chart XIII. Departures from the Daily Normal Barometric Pressure for each hour of 75th meridian time.

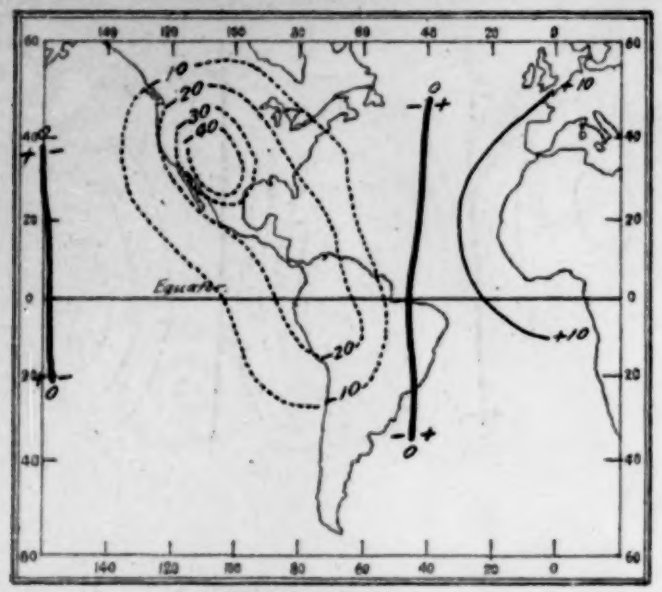


Fig. 19—7 p. m.

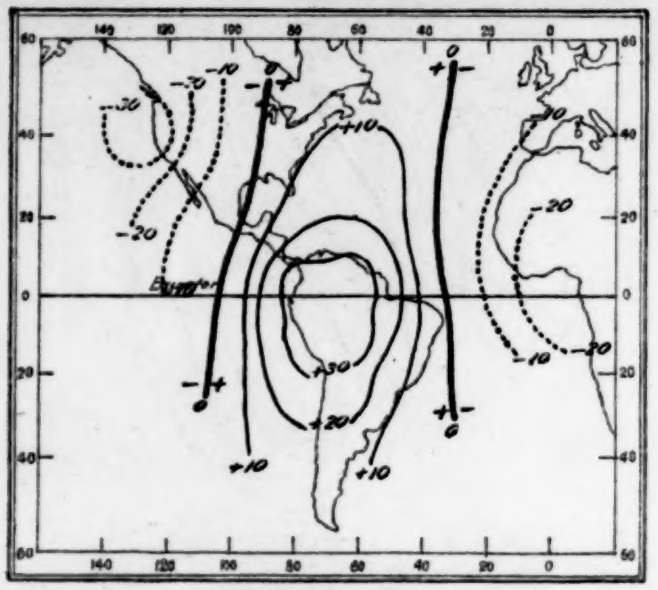


Fig. 22—10 p. m.

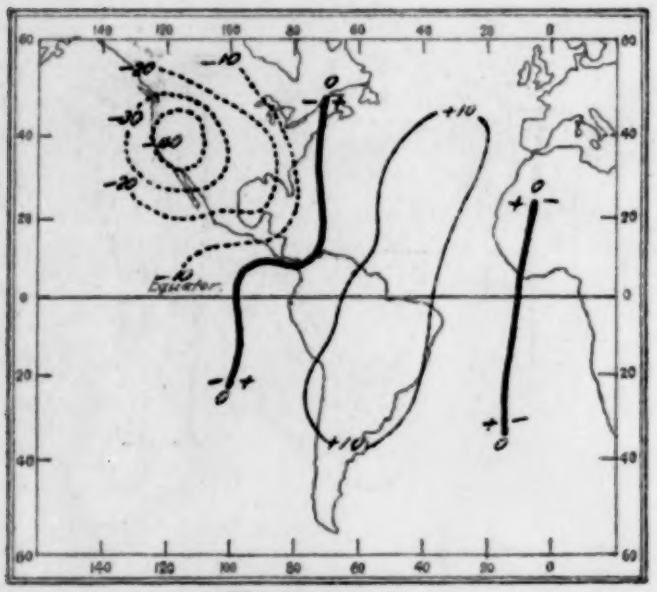


Fig. 20—8 p. m.

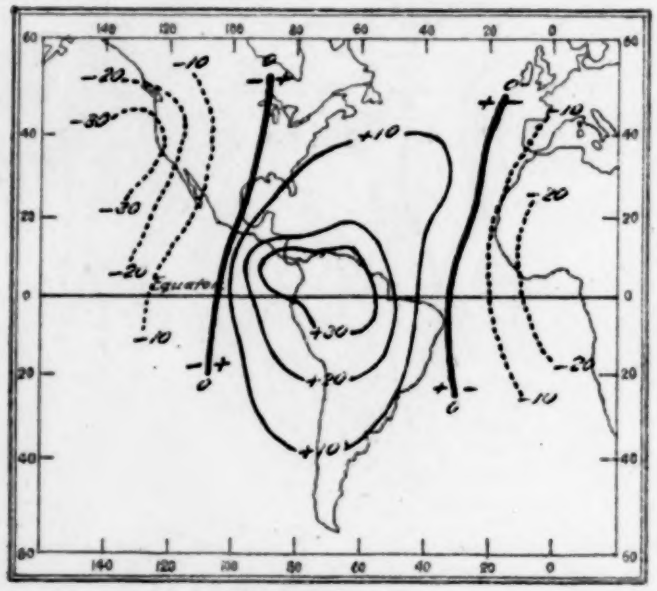


Fig. 23—11 p. m.

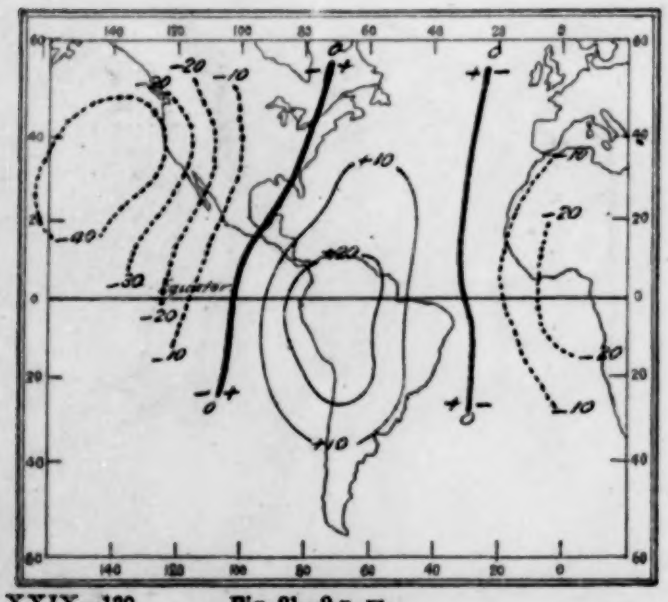


Fig. 21—9 p. m.

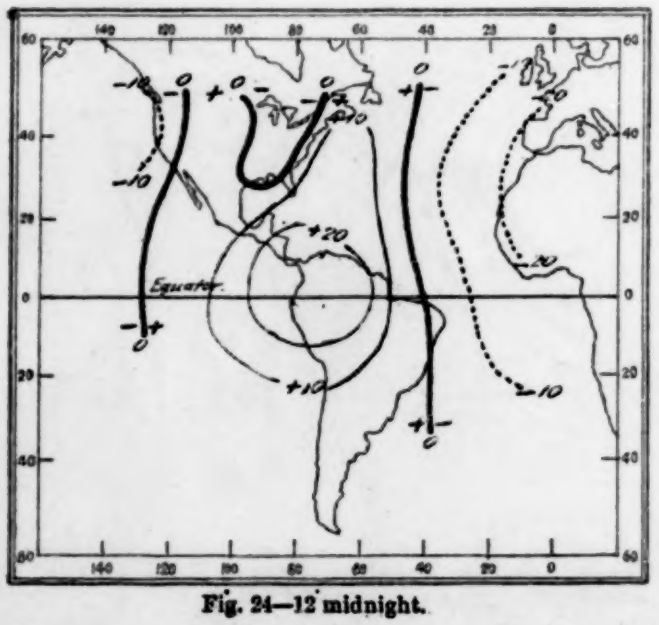


Fig. 24—12 midnight.